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QUARANTINE SERVICE.

SERVICE PUBLICATION NUMBER 4.

SMALL-POX EPIDEMIC IN NEW SOUTH WALES

1913

BY

D. G. ROBERTSON, M.D., D.P.H.,

Chief Quarantine Officer for Victoria.

ISSUED UNDER THE AUTHORITY OF THE MINISTER FOR TRADE AND CUSTOMS

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PREFACE

The cases of small-pox which have occurred in Sydney during the last eighteen months have been uniformly mild in character, and this type has been recognised in America as a distinct clinical variety of small-pox, while the fact that the disease actually is small-pox is nowhere contested.

It is of the utmost importance that Quarantine officers should have a complete description of the disease as it has manifested itself in Sydney, in order that mistakes in diagnosis may be avoided, and accordingly this pamphlet has been compiled by Dr. Robertson, and is being officially issued.

It is important that the true nature of the disease be not lost sight of, and that no undue importance be attached to the mildness of the present form. The disease is small-pox, and will remain small-pox, and all known facts of epidemiology offer a warning that the present mild and atypical form will not remain constant, but may be expected sooner or later, under the influence of factors little understood, to assume the more virulent normal characteristics of the disease.

J. H. L. CUMPSTON, M.D., D.P.H.,
Director of Quarantine.

19th November, 1914.

SMALL-POX EPIDEMIC.

NEW SOUTH WALES, 1913-14.

By D. G. Robertson, M.D., D.P.H., Chief Quarantine Officer for Victoria.

The following notes deal with the type of variola consistently met with throughout the course of an extensive epidemic which began in Sydney, New South Wales, in May, 1913, and still continues.

The disease was introduced probably from the United States of America, and it will be shown that the type of disease hereafter described is identical with that prevalent in North America at the present time, accounts of which are given by Herman Spalding, Chicago, and Hodgetts, Ontario.

HISTORICAL ACCOUNT OF THE PRESENT TYPE OF DISEASE.

The disease is said to have been introduced in 1897 into the southern part of the United States of America from Cuba, during the time of the Spanish–Cuban War. From the south this form of small-pox gradually became disseminated throughout most States, and was introduced into Essex County, Canada, from the adjoining State of Michigan in 1899. The disease spread into most of the provinces of Canada, and is there in epidemic form at the present time. In both the United States of America and Canada great diversity of opinion existed as regards diagnosis when the disease first made its appearance. Chicken-pox, giant chicken-pox, impetigo contagiosum, Cuban itch, cutaneous disease of a new type, were terms applied to it in diagnosis, and in numerous instances it existed for some considerable time before the exact nature was recognised. Epidemics of a similar nature have from time to time been described.

Jenner in 1798 drew attention to a species of small-pox which seven years before spread through many of the towns and villages of Gloucestershire. He states it was of so mild a nature that fatal results were rarely heard of, and that he never saw or heard of an instance of its being confluent. There is not sufficient data, however, to decide whether this epidemic was similar to the variety of small-pox now occurring in New South Wales, or merely a mild form of the more familiar type of the disease.

An outbreak of varioloid varicella was described by Izett W. Anderson as occurring in Jamaica in 1863. Brownlee and Thomson drew attention to an outbreak of a variolous nature among lascar seamen in Glasgow, 1898. De Korte, in 1904, gives a description of an epidemic of amaas, or Kaffir milk-pox, prevailing at that time in South Africa. He gives a comparative table of small-pox, amaas, and the two diseases of a variolous nature previously mentioned, as follows:—

A Comparative Table of Small-pox, Amaas, and of two Diseases of a Varioloform Nature which have been described by Dr. Brownlee and Dr. Thomson, and by Dr. Izett W. Anderson.

—	Amaas.	Natural Small-pox.	Infectious Diseases in Lascars.	Varioloid Varicella.
Incubation ..	Ten to fourteen days	Ten to fourteen days ..	Ten to fourteen days	Fourteen days
Effects of vaccination and previous attacks of variola	Sure preventive. Only one case occurred, in a woman, aged 63 years, who had suffered from small-pox 60 years previously and bore unmistakable evidence of the attack	Sure preventive. Second attacks rare	In eleven cases previous vaccination had no immunizing effect. Previous attacks of variola seemed to have little controlling effect	Disease occurs equally in vaccinated or unvaccinated persons. It occurred in those deeply pitted by antecedent small-pox
Effects of vaccination during convalescence	Modified vaccinia	None at all	Four out of five patients were successfully vaccinated; the fifth failed. This patient had previously suffered from small-pox	Not noted
Date of eruption ..	Third day	Third day	First day	In the course of the third day of the disease
Distribution of rash on the body	The body generally; not uniformly; always most markedly on the face, front of the legs, extensor surfaces of the forearm, palms of the hands, and soles of the feet	As for amaas	No special affinity for the face. No eruption on the palms of the hands and soles of the feet. On the legs elements were more sparse and scattered. The back was chiefly affected	
Initial rashes ..	Were not observed	Occurred	Not mentioned	Not mentioned

A Comparative Table of Small-pox, Amaas, and of Two Diseases of a Varioloform Nature, etc.—*continued.*

—	Amaas.	Natural Small-pox.	Infectious Diseases in Lascars.	Varioloid Varicella.
Evolution of the pock	In from 36 to 48 hours the macule with its small conical centre has passed through the papular stage and has become a fully developed flat-topped vesicle. The vesicles are partially divided by fine trabeculæ. In 96 hours the vesicle is pearly, and in 100 hours is waxy-white in appearance. The polynuclear lymphocytes are losing staining reactions and becoming pus cells. A number of pustules are without areolæ. Umbilication and pseudo-umbilication are present	Vesicle attains limit of its growth about the fifth day of the eruption. Loculated. Pustule formed on the eighth or ninth day surrounded by a vivid areola. Umbilication present	Vesicles almost entirely absent; such as do exist resemble small bullæ such as might have been produced by scalding water. Vesicles partially divided by fine trabeculæ. Vesicular contents originally clear become cloudy and distinctly seropurulent; but in no instance were true pustules formed. Pseudo-umbilication produced by desiccation of central portion of vesicle	Papular stage lasts from 24 to 48 hours. Eruption presents papular and vesicular stages, and only in some cases the pustular stage. Vesicles in some cases resembling those of variola and in others those of varicella. Umbilication not constant
Fever	Defervescence with first appearance of eruption. No secondary fever	Defervescence with first appearance of eruption. Secondary fever	No defervescence as in variola. No secondary fever	The temperature was of a remittent type without secondary fever
Race and age ..	Predilection for individual negroes in unvaccinated community, also individual Europeans, but in much lesser degree. Disease mild in sucklings and children, often aborting in former. Fatality for all ages low	All unvaccinated persons susceptible with trifling exception. Very fatal to children under five years. Fatality for all ages is high	Confined to Lascars. Out of 250 English workmen exposed to infection not one contracted this disease. No mortality	Chiefly among natives. Europeans susceptible
Initial symptoms ..	Headache, slight cold in the head, slight sore throat, glands of the neck enlarged. Vomiting and occasional backache	Backache, headache, vomiting; sore throat and enlarged glands not usual		Constant catarrh of the throat with eruption on the soft parts.

Dickson and Lassalle in 1903 describe an outbreak of varioloid varicella in Trinidad. The first cases occurred in April, 1902, and were diagnosed varicella. The source of infection probably came from Venezuela, where it was known as Lechine (Spanish

for chicken-pox). The disease in Venezuela had existed since 1901. A table is given, comparing amaas, varioloid varicella (Trinidad), and the present epidemic of small-pox in New South Wales :—

——	Amaas.	Varioloid Varicella.	Variola, New South Wales Epidemic.
Incubation ..	Ten–fourteen days ..	Ten–fifteen days; uncertain	Thirteen days; uncertain
Effects of vaccination and previous attacks of variola	Sure preventive. Only one case occurred, in a woman, aged 63 years, who had suffered from small-pox 60 years previously, and bore unmistakable evidence of the attack	Of 312 cases reported on, 28 were recently successfully vaccinated; 4 within 1 year; 8 within 3; 4 within 4; and 11 within 8. Twelve cases of second attacks occurred one to seven months after complete recovery	Sure preventive
Effects of vaccination during convalescence	Modified vaccinia ..	In 185 cases, fifteen were successfully vaccinated	Out of 675 patients, one was successfully vaccinated on second day of eruption
Date of eruption	Third day	Usually fourth day. Rarer between first day and eighth day	Most common fifth day. Varies between first and eleventh days
Distribution of rash on body	The body generally, not uniformly; always most markedly on the face, front of the legs, extensor surfaces of the forearm, palms of the hands, and soles of the feet	As for amaas ..	As for amaas
Initial rashes ..	Were not observed ..	Were not observed ..	Only two cases reported, and these of doubtful nature
Evolution of pock	In from 36 to 48 hours the macule, with its small conical centre, has passed through the papular stage and has become a fully developed flat-topped vesicle. The vesicles are partially divided by fine trabeculæ. In 96 hours the vesicle is pearly and in 100 hours is waxy-white in appearance. The polynuclear lymphocytes are losing staining re-actions and becoming pus cells. A number of pustules are without areolæ. Umbilication and pseudo-umbilication are present.	As for amaas; but stages of maturation are very irregular. Rash invades the body in separate crops. Frequently well formed vesicles seen on the first day of rash. True umbilication is exceptional	As for varioloid varicella

Amaas, Varioloid Varicella (Trinidad), and the Present Epidemic of Small-pox in New South Wales—*continued.*

——	Amaas.	Varioloid Varicella.	Variola, New South Wales Epidemic.
Fever ..	Defervescence with first appearance of eruption. No secondary fever	Defervescence with first appearance of eruption. Mild secondary fever in 5 per cent.	Defervescence with first appearance of eruption. Only semi-confluent cases show secondary fever of mild type
Race and age	Predilection for individual negroes in unvaccinated community, also individual Europeans, but in much lesser degree. Disease mild in sucklings and children, often aborting in former. Fatality for all ages is low	Europeans spared. Age period 20–30 most affected. Fatality for all ages low	Age period 20–30 most affected. (In United States of America appeared to start among the southern blacks, but later in other portions of the country the whites constituted the great majority of cases.) Fatality or all ages low
Initial symptoms	Headache, slight cold in the head, slight sore throat, glands of the neck enlarged. Vomiting and occasional backache	General muscular pains, fever and headache in most cases. Backache most constant. Vomiting in 25 per cent. Symptoms varied from headache and slight pyrexia to high fever and delirium	Occasionally none. Headache most constant; backache, shivering, vertigo, vomiting, general muscular pains. Often quiescent period between symptoms of onset and appearance of eruption
Hæmorrhagic cases	Unknown	Unknown	Unknown

It is evident that the disease among the lascars was not of the same nature as the others. The varioloid varicella outbreak in Jamaica resembles closely the other forms, but differs most markedly in the scant protection given by vaccination and antecedent attacks of small-pox. It would appear that amaas, varioloid varicella (Trinidad), and the mild variola existing in North America and New South Wales were the same disease. Varioloid varicella (Trinidad) differs from the other two by showing greater incidence amongst the recently vaccinated and the occurrence of second attacks in persons who have recently recovered from the disease. Both amaas and varioloid varicella differ from the mild variola by reason of the frequency with which successful vaccination can be performed during convalescence.

BIBLIOGRAPHY.

Spalding, Herman ..	..	*Journal A.M.A.*, 3rd August, 1901.
Hodgetts, Chas. A.	..	A Descriptive article on Small-pox, issued by the Provincial Board of Health of Ontario, 1905.
Anderson, Izett W.	..	Epidemic Varioloid Varicella in Jamaica. Transactions of Epidemiological Society of London, Vol. II., p. 414. *Lancet*, 19th November, 1898, p. 363.
Brownlee and Thomson	..	*Lancet*, 22nd October, 1898, p. 1051. *Lancet*, 10th December, 1898, p. 1581.
De Korte, W. E. ..	..	Amaas, or Kaffir Milk-Pox. *Lancet*, 7th May, 1904, p. 1273.
Dickson and Lassalle	..	Varioloid Varicella in Trinidad. B.M.J., 26th September, 1903, p. 711.

CLINICAL FEATURES OF THE EPIDEMIC IN SYDNEY.

ADMISSIONS TO QUARANTINE STATION.

Between the 1st July and the 31st January, 1914, there were 1,402 admissions to the Quarantine Station, North Head. One thousand and one were small-pox patients and 401 contacts. Thirty-six contacts subsequently developed the eruption, making the total number of confirmed cases 1,037. One child was born on the Station. Twelve were admitted as patients, but were found on examination to have been diagnosed in error.

The following list gives the numbers of the patients and contacts admitted during the different months :—

	Patients.			Contacts.		
	Males.	Females.	Total.	Males.	Females.	Total.
July	182	151	333	46	57	103
August ..	135	113	248	7	17	24
September ..	130	81	211	12	14	26
October ..	62	50	112	4	12	16
November ..	32	31	63	58	65	123
December ..	17	13	30	32	29	61
January ..	10	6	16	20	16	36
Totals ..	568	445	1,013	179	210	389

It will be noted from the above that more than half were admitted during the first two months. The greatest number of patients and contacts at any one time on the Station was 309.

Discharges were as follows :—

	Patients.			Contacts.		
	Males.	Females.	Total.	Males.	Females.	Total.
July	37	36	73	36	48	84
August ..	148	112	260	13	9	22
September ..	132	100	232	7	14	21
October ..	126	97	223	12	15	27
November ..	72	60	132	24	39	63
December ..	27	29	56	55	52	107
January ..	22	10	32	19	16	35
	564	444	1,008	166	193	359

These are stated according to admittance, no account being taken of contacts who developed the disease, or of cases admitted through wrong diagnosis.

At the end of January there were seventeen patients and eighteen contacts remaining on the Station.

NATIONALITY.

Of the 1,037 confirmed cases, 1,020 were whites, 6 Eurasians, 5 Negroid, 3 Chinese, 1 Indian, 1 Maori, and 1 Aboriginal.

AGE AND SEX INCIDENCE.

In the following table, which deals with the 1,037 confirmed cases, the term "vaccinated" means those successfully inoculated before exposure to infection :—

Years.	Males.		Females.	
	Unvaccinated.	Vaccinated.	Unvaccinated	Vaccinated.
0–5	29	..	46	..
5–10	42	..	42	..
10–15	43	..	42	..
15–20	73	..	76	..
20–30	246	2	156	..
30–40	73	7	48	5
40–50	21	13	22	8
50 and over ..	18	7	7	11
Total ..	545	29	439	24

Five hundred and seventy-four males were attacked and 463 females.

The youngest patient was five days old on the appearance of the eruption, and the oldest 82 years.

The 20–30 years age period had by far the greatest number, embracing 40 per cent. of the total number attacked.

CLASSIFICATION OF ERUPTIONS.

Only three groups of cases occurred, namely, mild discrete, discrete, and semi-confluent.

Mild Discrete.—This group comprised those in whom the eruption was very slight, consisting of a few scattered pustules. These cases often gave rise to great difficulty in diagnosis owing to the sparsity of lesions. The period of onset in these cases was often as severe as in those with profuse eruptions.

Discrete.—These comprised those in whom the eruption was moderately severe, but in whom the lesions were discrete. They often had marked œdema of the face and nose, but secondary fever was very slight.

Semi-confluent.—These comprised those cases in which the lesions were so closely set as to leave little or no healthy skin visible between them. Many of these ought more strictly to have been classed as confluent, as the pocks in certain areas became confluent, especially on the nose and cheeks. These all had some secondary fever.

The severity of the attack was not recorded in several cases admitted in the convalescent stage. The following table gives the different types met with in the vaccinated and unvaccinated :—

——	Semi-confluent.	Discrete.	Mild Discrete.	Not recorded.
Vaccinated ..	3	16	32	2
Unvaccinated ..	44	376	514	50
Total ..	47	392	546	52

One death occurred in the semi-confluent unvaccinated. (This case is described on page 22.)

VACCINATION.

Of the 1,037 cases, 717 were not vaccinated at all, 109 were successfully and 211 unsuccessfully vaccinated before the appearance of the small-pox eruption.

The successful vaccinations were distributed as follows :—

(1) *Within the Incubation Period.*—A total of 56. These were as follows :—

One day before eruption	..	..	1 case
Two days ,,	..	..	1 ,,
Three days ,,	..	..	3 cases
Five days ,,	..	..	2 ,,
Six days ,,	..	..	6 ,,
Seven days ,,	..	..	6 ,,
Eight days ,,	..	..	7 ,,
Nine days ,,	..	..	6 ,,
Ten days ,,	..	..	9 ,,
Eleven days ,,	..	..	7 ,,
Twelve days ,,	..	..	2 ,,
Thirteen days ,,	..	..	4 ,,
Fourteen days ,,	..	..	1 case
Fifteen days ,,	..	..	1 ,,

Four of these had been previously recently unsuccessfully vaccinated. In the two cases in which the eruption appeared on the fourteenth and fifteenth days after vaccination, the onset of symptoms occurred in both cases four days before the eruption.

(2) *During infancy or more than thirteen years prior to attack.*—A total of 53. Two of these were vaccinated successfully a second time more than thirteen years before; twelve were vaccinated subsequently in the incubation period unsuccessfully, and four a few weeks before the eruption unsuccessfully.

(3) *Between these two periods.*—Nil.

The unsuccessfully vaccinated were distributed as follows :—

(*a*) *Within the incubation period.*—One hundred and twenty-three. Ten of these were vaccinated unsuccessfully a second time within the incubation period.

(*b*) *During infancy.*—Nineteen. These were cases giving a history of infantile vaccination but showing no cicatrices. Three of these were vaccinated subsequently in the incubation period unsuccessfully.

(*c*) *Between infancy and the incubation period.*—Sixty-nine. All these were vaccinated within the five months preceding exposure to infection. Seventeen of these were vaccinated a second or third time unsuccessfully.

Six hundred and seventy-five patients were vaccinated for the first time at varying periods after the appearance of the small-pox eruption. In only one instance was an undoubted successful reaction recorded, the inoculation being performed on the second day of eruption.

It will be seen from the preceding tables that a single vaccination successfully performed does not confer lifelong protection, but that it certainly has a prophylactic effect for a number of years. It is a significant fact that no case occurred in a vaccinated person under twenty years of age, or less than thirteen years after vaccination, whereas in the unvaccinated no less than 393 contracted the disease in the first twenty years of life. Over 50 years of age, more vaccinated than unvaccinated females were attacked. The influence of vaccination in modifying the severity of the eruption is not emphasized in the present epidemic owing to the fact that so many cases of an extremely mild nature occurred in the unvaccinated. An analysis shows that the vaccinated really suffered as severely, as 6 per cent. of the former and only 5 per cent. of the latter had semi-confluent eruptions. One of the severer cases occurred in a woman who had been twice successfully vaccinated, although over twenty years had elapsed since the second vaccination.

It seems beyond doubt that a recent successful vaccination is an absolute protection against this disease, and that the protection conferred lasts some years, thirteen years appearing to be the limit. A striking example of the efficacy of vaccination is afforded by the fact that no case occurred among the Station staff, or visitors to the Station. No one is allowed to reside on or visit the Station unless protected by a recent successful vaccination, or proved immune by repeated unsuccessful inoculations. A large number of workmen was employed throughout on the construction of new buildings. Since the outbreak of the epidemic, the number of visitors and persons employed on the Station was as follows :—

Medical staff (doctors and nurses)	19
Permanent Station staff	11
Families of permanent staff	11
Temporary attendants	41
Visiting medical practitioners	35
Workmen employed by Public Works Department	126
Others	18
	261

All of these came in close contact with the patients.

It is claimed that a successful vaccination performed two days after exposure to small-pox will ward off the disease. Two cases developed the eruption, one fourteen and one fifteen days after the inoculation, the onsets occurring on the tenth and eleventh days after inoculation respectively. If the incubation period were definitely twelve days, then the preceding claim could not be held established. In this epidemic the incubation period is very indefinite, in some undoubted instances being as long as fifteen and sixteen days. Both these patients were exposed a few days to infection, and probably were incubating the disease at least three days before being vaccinated. This is supported by the fact that amongst a number of cases which were vaccinated successfully after one exposure, in none did the disease develop when the inoculation was performed before three days after that exposure.

In some instances successful vaccination performed after exposure to small-pox seems to have aborted the disease before the appearance of the eruption, although the patient had acquired the disease. Several contacts admitted to the Station were isolated on account of developing the typical symptoms of onset of small-pox. They were acutely ill for a few days, with high temperature, and complaining of severe headache, vertigo, backache, shivering, vomiting, epigastric pains, and general aches and pains, and then these symptoms suddenly subsided without any eruption. These symptoms most frequently appeared from the fifth to the ninth day after inoculation, and were definitely those of variola onset and not symptoms of vaccinia.

THE PERIOD OF INVASION.

The symptoms of onset were not recorded in a number of cases, and could not be elicited in young children, but reliable histories were obtained in 722 cases.

Of these, 37 had no symptoms whatever prior to the eruption. In the others the symptoms most frequently noted were headache, backache, shivering, vertigo, vomiting and nausea, aches and pains in the limbs and joints, and abdominal pains.

Fifty-six of these were not sufficiently prostrated to cause them to retire to bed, and many of them followed their usual occupation until discovery.

The most constant feature was *headache*. This occurred in 627, or 86 per cent. The headache was usually frontal, but occasionally occipital. *Backache* was present in 452, or 62 per cent. It was usually referred to the sacrum or across the loins. *Shivering* occurred in 427, or 59 per cent. This was usually merely an uncomfortable feeling of chilliness. Actual rigors were uncommon. *Vertigo* was present in 317, or 43 per cent. This symptom was very severe in some cases, and sometimes was present without any headache. *Vomiting and nausea* occurred in 389, or 54 per cent. Actual vomiting occurred in 299, or 41 per cent. *Pains and aching in the limbs and joints* were present in 298, or 41 per cent. Many of these compared the feeling as similar to " having been beaten all over with a stick." *Abdominal pains*, usually referred to the epigastrium, occurred in 89, or 13 per cent.

Anorexia and insomnia were usually noted.

Drowsiness was frequently present, and in young children was the commonest initial feature. *Convulsions* occurred in two children, one three and the other eleven years of age. *Sore throat, pains in the chest, pains in the shoulders and back of neck, diarrhœa* were all occasionally complained of. *Delirium* was not uncommon. In some cases the *spleen* was definitely enlarged, sufficiently so as to be easily palpated. This subsided rapidly after the appearance of the eruption.

The symptoms of onset are most frequently mistaken for influenza. Eleven cases were admitted into the wards of the Sydney hospitals, five being diagnosed as enteric fever, one as appendicitis, four as abdominal cases for observation, and one, seven months pregnant, was admitted into the Royal Hospital for women under the impression that labour was setting in.

As a rule, these symptoms subsided as soon as the eruption appeared, but in 40 cases they continued after, in 21 for one day, in 12 for two, in 5 for three, and in 2 for four days. Backache is quite commonly complained of in severe cases for several days after the eruption.

THE INITIAL FEVER.

In most cases the temperature was elevated in the prodromal stage. The highest temperature recorded was 105°. Chart 1 shows the typical temperature of onset. In most cases the fever subsided rapidly to normal on the appearance of the eruption.

The duration of the invasion stage varied. The eruption most frequently appeared four days after the onset of symptoms, but it was delayed undoubtedly in some cases to as late as the tenth. In 755 cases, the eruption appeared in 9 on the same day, in 28 one day, 76 two, 135 three, 205 four, 154 five, 80 six, 51 seven, 10 eight, 4 nine, and 3 ten days after the first symptoms.

QUIESCENT PERIOD.

In many instances a quiescent period between the subsidence of the initial symptoms and the appearance of the eruption was noted. Patients after being in bed one or two days felt perfectly recovered and returned to their work, the eruption appearing at various intervals afterwards. Two hundred and twenty-nine patients gave that history, 76 having a remission of one day, 78 of two days, 43 three days, 20 four days, 7 five days, 2 six days, 2 seven days, and 1 eight days.

A remission of two days was noted in a contact who developed the eruption in the Station, but the temperature did not reach normal until the rash appeared, although relief was obtained from symptoms.

PRODROMAL RASHES.

In two cases rashes were recorded in the prodromal period, but had disappeared before the patients' arrival in quarantine. Their histories are given below :—

Case T. J., female, aged five months.—On the 11th September, 1913, seemed feverish and restless. This lasted until the 15th. On the 16th September, 1913, the mother states a rash " like measles only smaller " appeared on the back and nowhere else. It felt slightly rough to the touch. The spots were minute and red in colour (no white or yellow heads), and were thickly set all over the back. The rash became fainter the next day, 18th, when the small-pox eruption appeared on the face, buttocks, and back. On admittance to the Station on the 23rd September, 1913, no trace of the first rash was visible. The child had a very slight eruption, the back only having a few lesions.

Case E. C., female, aged 32.—On 26th September, 1913, patient complained of frontal headache, pains in back from the shoulders down, aching in the legs and arms, and shivering. The symptoms lasted five days. On day of onset a rash " like prickly heat " appeared on the back of the left hand, inner side of knees, and right round the back of the thighs (in this order). The rash was very itchy and rough to touch, and consisted of little red papules with no white or clear heads. This was probably vaccinal, as patient was vaccinated on 1st September, 1913, a " mulberry " reaction resulting. It

I. J. — FEMALE — AET. 11.

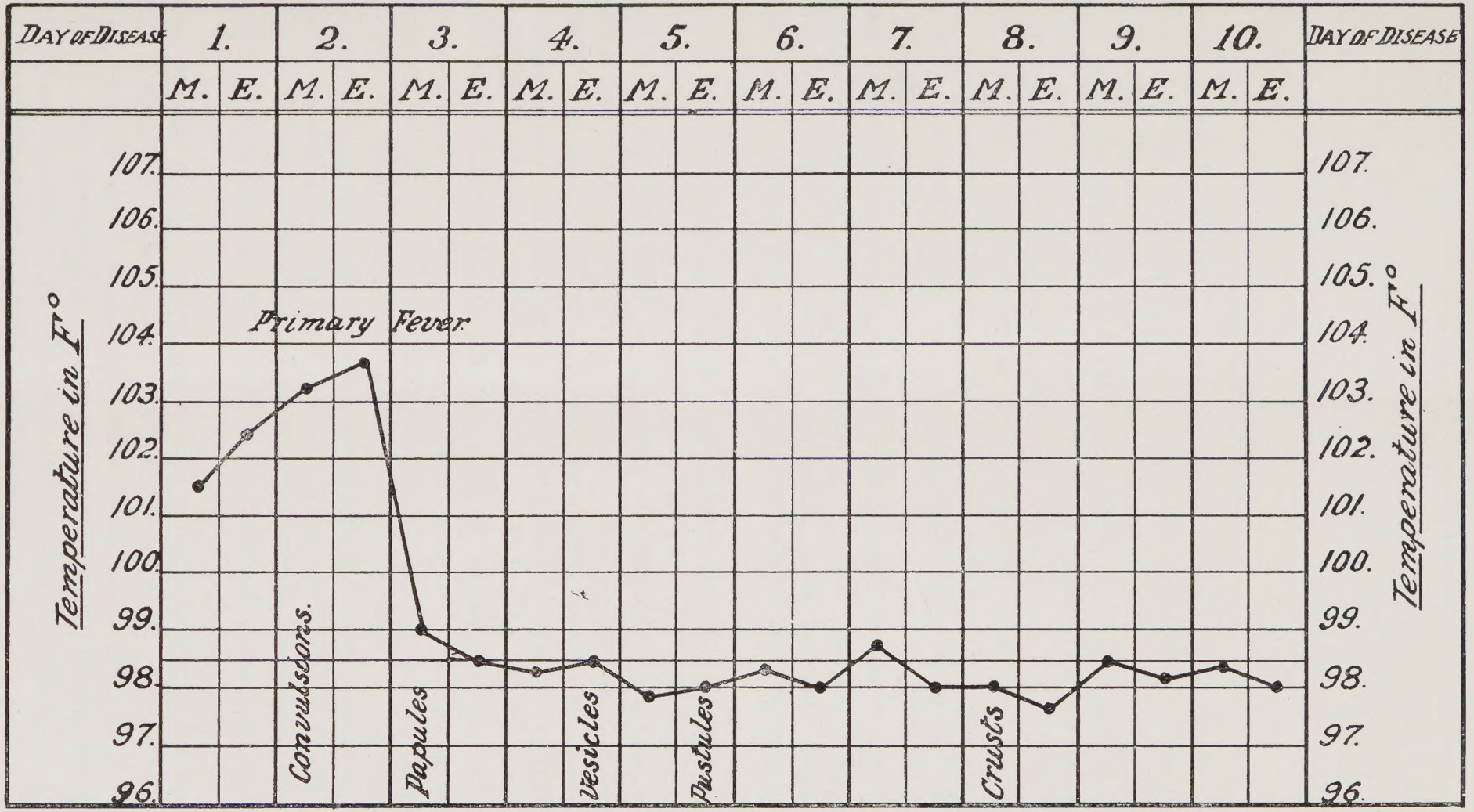


CHART No. 1.

DISCRETE SMALLPOX.

the lesions appear first on the face and forehead as dull-red spots or macules and on the neck, body, and upper limbs soon after.

It takes three days at least for the eruption to be complete in the limbs, and it was noted very frequently that the distal ends of the limbs were practically without any lesions for a day or two and then got a fairly profuse eruption. The wrists and forearms are, however, occasionally the first places for the eruption to appear.

Often the first site of eruption is around some place of irritation, such as vaccinal inoculation, sores, &c.

Frequently patients point to one or two lesions, and state that they appeared a day or two before the others. They occurred most frequently on the face and upper arms, and were always larger and ahead of the rest in development. The condition of the face is always more advanced than that of the other parts of the body, frequently crusts having formed there whilst the distal extremities of the limbs were still vesicular.

Coming out in crops, the lesions in any one region are not necessarily in the same stage of development, and vesicles, pustules, and crusts may be seen side by side.

THE SECONDARY FEVER.

Even in the most severe cases this was very slight. In two a temperature of 104° was recorded. Chart 2 shows that of a semi-confluent attack with the most marked secondary fever of any. Charts 3 and 4 give two cases that were practically confluent.

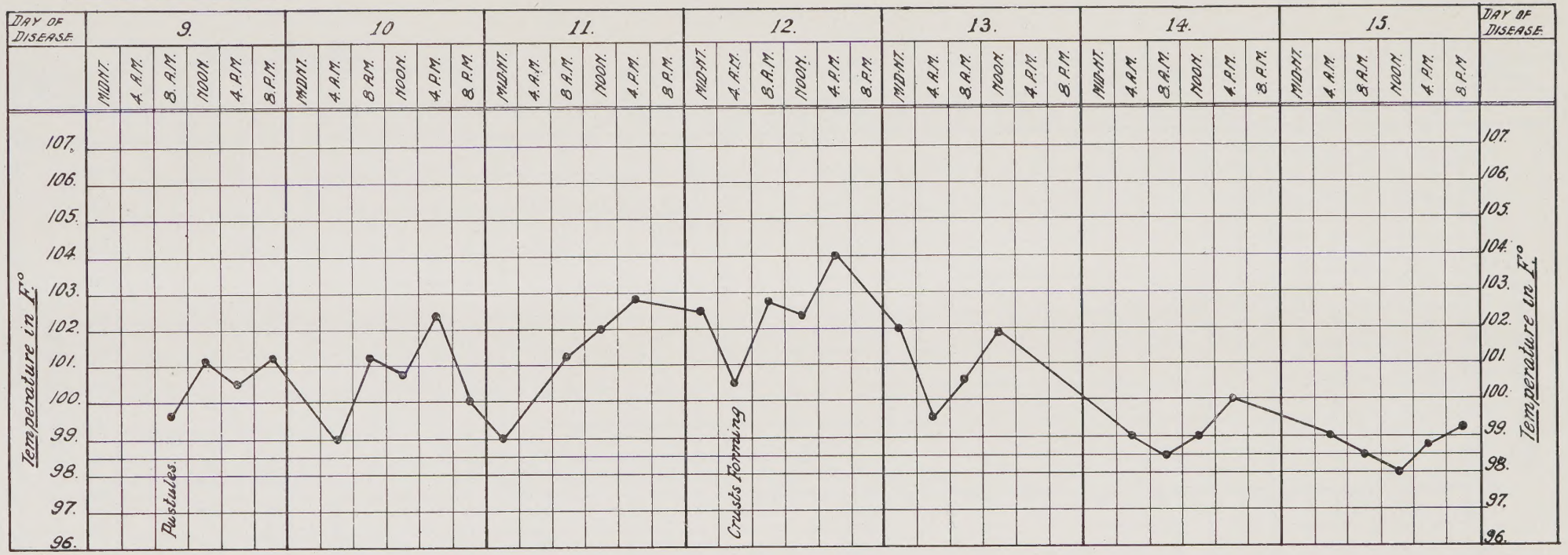
Prostration was practically absent, and, with one exception, no patient was at any period in a condition that might be regarded as dangerous. Stimulants were given very rarely.

Just immediately prior to the appearance of the eruption in severe cases a sensation of pricking or smarting is experienced.

During the height of pustulation a great amount of burning and smarting pains is experienced, especially in the face, hands, and feet. Actual itchiness is uncommon, but this is sometimes complained of after the rupture of the pustules. In severe cases there is a great amount of swelling where the rash is profuse. The face looks very inflamed, the lesions standing out in relief. The face is puffy, the eyelids œdematous, the nose typically saddle-shaped. The features are obliterated. In the severest cases the patient presents a most revolting appearance. The mouth remains open and saliva trickles out. The teeth and gums are covered with sordes and the tongue is harsh and dry. Swelling of the throat gives rise to considerable discomfort in swallowing. The hands and fingers are very swollen and stiff, and the hands are held partly flexed. The feet are also very swollen. The pustules are extremely tender on palpation. The weight of the bed-clothes and the pressure of the body on the mattress cause great distress. Backache is very commonly complained of. Insomnia is a frequent symptom, but delirium was not recorded in a single instance. Rigors occurred in two, but only on a single occasion in each. The pulse was often more rapid than the temperature would warrant, but 130 was never exceeded.

Adenitis is very common in severer cases, occasionally progressing to suppuration.

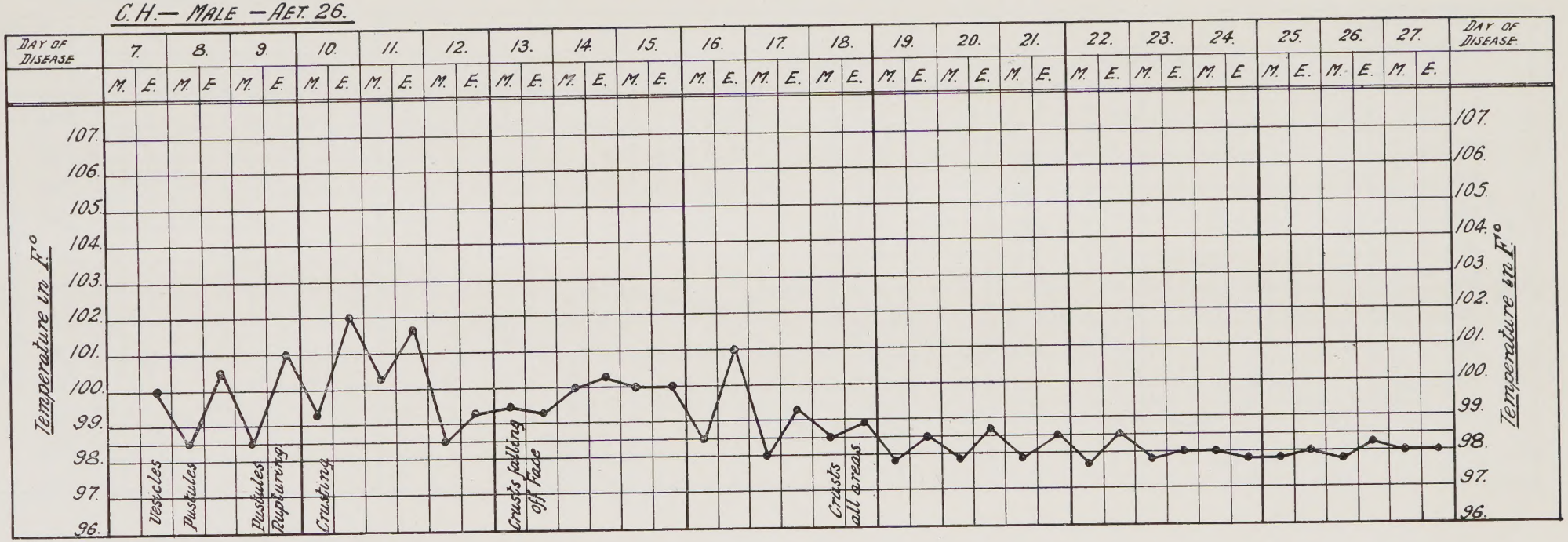
M. H.— MALE — AET. 15.



— CHART No 2. —

SEMI-CONFLUENT SMALLPOX.

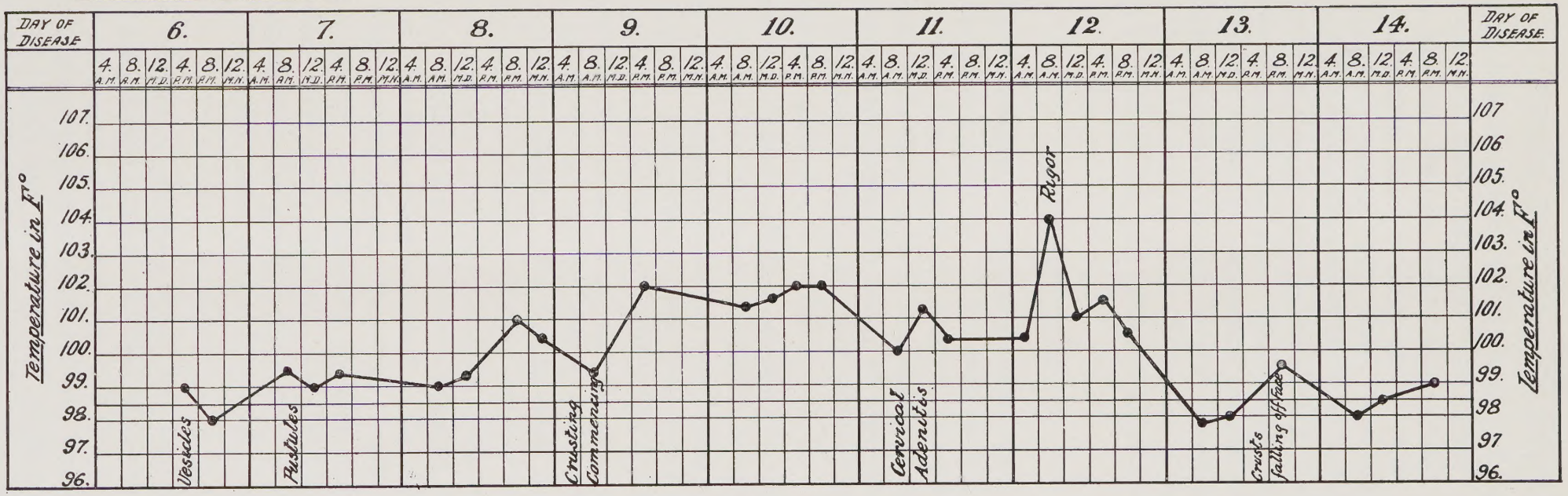
C.H.— MALE —AET. 26.


DAY OF DISEASE
7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27.
M. E.
Temperature in F°
107. 106. 105. 104. 103. 102. 101. 100. 99. 98. 97. 96.
Vesicles
Pustules
Pustules rupturing
Crusting
Crusts falling off face
Crusts all areas
DAY OF DISEASE

— CHART Nº 3.—

SEVERE SEMI-CONFLUENT SMALLPOX.

W. H.— MALE.— AET 21.



— CHART Nº 4.—

SEVERE SEMI-CONFLUENT SMALLPOX.

STAGE OF CONVALESCENCE.

A reddish-brown staining after the separation of the crusts was all that could be seen in the great majority. In about 10 per cent. of the cases numerous shallow pittings with staining were left, in some leaving the face rough and coarse like a nutmeg grater owing to the projections of newly-formed cicatrical tissue. The parts that suffered most were the nose, the forehead just above the root of the nose, and the cheeks. After the separation of the crusts desquamation round the site of lesion was well marked, much more than occurs in varicella. Excrescences with firm raised bases were commonly seen after the separation of the crusts. These slowly subsided to pinkish macules level with the skin, but often further contraction took place, resulting in shallow pits. Warty granulomata also frequently occurred on the sites of lesions, and persisted for prolonged periods.

DISTRIBUTION.

The eruption is general, is identical with Asiatic small-pox, and is influenced by the same conditions. " The rash prefers the upper part of the body to the lower, it is a rash of the face and arms rather than trunk and legs. It is a rash of the distal ends of limbs rather than the proximal, of the back of the trunk rather than the front, of extensor surfaces rather than flexor; it is a rash which shuns the most pronounced flexures " (Ricketts and Byles, *Diagnosis of Small-pox*, p. 16).

The scalp was usually fairly affected, especially in the bald. The forehead, malar regions, and nose had the greatest eruption, the orbits and temples being spared. A few lesions occurred along the eyelid margins. Single lesions were observed, once in the ocular conjunctiva, just outside the cornea, and on two separate occasions on the palpebral conjunctiva. They appeared on the mucous membranes of the nose, mouth, and pharynx. The palate, tongue, uvula, pillars of the fauces, tonsils, and posterior pharyngeal wall were most frequently affected. No lesions were detected in the larynx. The ears on the exposed surface frequently suffered severely. On the neck, the posterior aspect and the projecting surfaces of the sterno-mastoids suffered most. The line of clothing was frequently strikingly demonstrated, very few lesions appearing upon the portion protected. The posterior triangle and episternal notch were always spared. The chest usually had a sparse eruption, the flanks particularly. The abdomen escaped most of all. The groins and hypogastrium were always spared. The back suffered more than the chest and abdomen, with the greatest eruption over the shoulders and least in the loins. The axillæ were invariably spared, lesions being present in very few.

The Upper Limbs.—The upper arms had less than the forearms, the inner surfaces being always spared; the back of the elbow frequently suffered severely. The extensor aspects and the radial and ulnar borders of the forearms suffered more than the flexor surfaces, where the tendons were a favorite site. The wrists and backs of the hands were more affected than the palms, where the hollow usually escaped. The fingers had more lesions on the extensor aspect. The ante-cubital fossa was invariably spared.

The Lower Limbs.—The ankles and feet suffered most; the front of the knees often had a profuse crop. The dorsum of the feet suffered more than the soles, and marked preference was shown for the tendons. The prominences of the soles and toes suffered more than the hollows. The eruption was always scanty in the popliteal space.

The *penis and scrotum* often suffered severely. Lesions were seen on the prepuce, glans penis, and sometimes inside the meatus. The *vulva* also had profuse eruptions in some cases.

The eruption showed great modification through the influence of attire, occupation, &c. Pressure and irritation patches were noted in numerous instances. The abdomen and chest often had a marked eruption in obese and pregnant women, due to the irritation produced by clothing. In babies the area covered by the napkin suffered severely in some cases, especially where the skin was excoriated. One well-marked binder rash occurred in a woman confined a couple of weeks before the eruption, a ring of lesions encircling the body.

A driver, who had followed his occupation during the prodromal stage of the disease, had an almost confluent eruption on the ulnar border of his forearm where it rubbed against his leg while driving. Ill-fitting boots caused numerous clusters on the feet, the most favorite site being over the Tendo Achilles.

Bracelets, collar studs, sores, vaccinal inoculations, &c., all produced clusters at the points of pressure or irritation.

In the milder cases where the lesions were extremely few no particular distribution could be observed. In one case a single lesion only was present, and in two others four and twenty respectively. Frequently in such mild cases whole regions were skipped. The palms and soles had no lesions in numerous cases. In a few children the body was almost entirely skipped, whilst the face and distal extremities of the limbs had a profuse eruption. It was not unusual to find one side of the body having a greater eruption than the other, probably explained by posture. The lower limbs frequently had almost an equal eruption to that of the upper.

COMPLICATIONS.

These were confined principally to skin and eye affections.

Skin Affections.—Boils and superficial abscesses were frequent, even in the mildest cases. The resisting power of the skin to bacterial invasions seemed to be very much lowered; sepsis, occurring in the slightest abrasions, often gave rise to unhealthy ulcers. An impetiginous condition frequently affected the lesions of the forearms, wrists, back of hands, legs and feet, and occasionally the body. An effusion of fluid occurred around the dried crusts, undermining the epidermis, the margins extending to the size of a sixpence or more. This condition usually cleared up very quickly.

Eye Affections.—Conjunctivitis was prevalent, but very mild.

Iritis occurred in six, and corneal ulcers also in six cases, the latter being very intractable to treatment, and permanent opacities will probably result. A suffusion of the conjunctiva immediately around the cornea, and often limited to one or two quadrants, was a very common occurrence.

Pterygium, if present, was always aggravated.
Otorrhea was noted on two occasions.
Respiratory System.—No complications recorded.

PREGNANCY.

Twenty-seven pregnant women developed the eruption. Premature labour or abortion took place in ten, and one died after giving birth to a healthy full-time male child.

Premature labour occurred in four. Two gave birth to healthy eight-months' children the day after the appearance of the eruption, which was mild discrete in both cases.

A third was confined with $6\frac{1}{2}$ months' twins nineteen days after a mild eruption. The twins were both slightly macerated, and showed traces of a mild eruption in the desiccation stage. The fourth was delivered of six months' twins, a few weeks after the eruption, which was mild. One twin was still-born without trace of eruption; the other was alive and was covered with a variola rash, and lived for a few days.

Abortion occurred in six cases. Five were mild attacks, the abortions occurring 19, 21, 24, 29, and 30 days after the eruption. In four there was no evidence of disease in the fœtus or placenta, in the fifth the fœtus had a profuse small-pox eruption in the pustular stage. The abortions occurred at $3\frac{1}{2}$, 3, 5, 4, and 4 months respectively. The sixth case was a woman, four months pregnant, with a severe attack of small-pox. The abortion took place on the twentieth day of eruption. The fœtus and placenta were not diseased. The woman was in a state of collapse for some time afterwards.

The placenta in one case was sent to the Microbiological Bureau for examination. The report was as follows:—

> "Nil remarkable to naked eye; some dark patches on under surface of placenta appear to be dilated veins or blood spaces.
>
> Sections taken from parts slightly raised and from dark patches.
>
> *Sections.*—Show polymorphonuclear infiltration in parts, also areas in which the chorionic villi have undergone cell necrosis; the areas of blood extravasation. All this suggests that through cutting off of nutrition the villi have undergone degeneration and subsequent invasion by *polymorphonuclear leucocytes.* There are numerous areas in and around the villi showing nuclear fragments without definite cell outlines.
>
> *Levaditi.*—No parasites (*spirochaetes*, &c.) seen."

Death resulted in an almost confluent case after delivery of a full-time healthy child on the fifth day of eruption, the patient collapsing and dying two and a half hours afterwards.

Sixteen were not affected. Four had severe attacks, and were all seven months pregnant. They eventually gave birth to full-time healthy children. The remaining twelve all had mild attacks, and embraced from two months to full term.

A short description of each of the pregnant cases is given as an Appendix to this Report.

Six babies were born whilst the mothers were in an infective state. Four developed the eruption 5, 9, 11, and 15 days after birth respectively. Of the other two, one was successfully vaccinated when two days old, and the other was three times unsuccessfully vaccinated, neither acquiring the disease.

One baby would thus appear to have been infected " in utero."

ERRORS IN DIAGNOSIS.

Twelve cases were admitted as small-pox cases, but were found on examination to have been diagnosed in error. They comprised four cases of varicella, three of impetigo, and one each of erythema multiforme, acne vulgaris, furunculosis, vaccinal urticaria with impetigo and insect bites.

These cases were all vaccinated on admission, the inoculations being successful in each instance, and none acquired small-pox.

The eruption has been mistaken for an iodide rash. Lesions on the pillars of the fauces were mistaken for diphtheria, and one patient was informed by a medical practitioner that the lesions on the glans penis were " chancres."

FATAL CASE.

A semi-confluent case of small-pox died two and a half hours after being delivered of a full-time healthy child. The patient had three children previously, all still-born but full time. No history of miscarriages. The labour was normal apart from some adherence to the placenta necessitating digital removal of contents of the uterus. The patient collapsed one hour after labour and failed to recover. Some *post-partum* hæmorrhage occurred, but not enough to cause a fatal result.

A *post-mortem* examination was made the same night.

The uterus was firmly contracted ; the mucus membrane clean and smooth. A little clotted blood was present.

The liver and spleen were both slightly enlarged, but appeared healthy on section.

Kidneys.—The capsule was slightly adherent over the right, otherwise both appeared normal.

Stomach and intestines healthy.

Lungs healthy.

Heart in a condition of asystole. The valves and endocardium healthy. Myocardium presented an appearance of cloudy swelling.

The degree of anæmia was not such as would be found in a case of fatal hæmorrhage.

Sections of the skin, liver, spleen, and right kidney were sent for examination to the Microbiological Bureau. The report was as follows :—

"B. of M. 13/3569.

L. 006117.

Report on Specimens consisting of Skin and Organs, Case of Variola (M.M.).

Sections—

Kidney.—Cells of some of the convoluted tubules are granular, with indistinct outlines and somewhat swollen apart from its normal.

Liver.—Normal.

Spleen.—Normal.

Skin.—Sections through vesicle show small spaces of varying size, larger nearer surface, but extending down to the rete malpighi, due to the separation of the epithelial cells by transudation into lymph spaces.

There is also considerable polymorphonuclear leucocytic invasion into the spaces thus formed. The nuclei of the pus cells often show fragmentation.

Numerous scattered bodies dark, and with lighter ring to one side, and of varying size, are probably the remains of degenerated nuclei.

In the deeper pustules, the vesiculation has separated the malpighian cells from the cutis vera, but does not seem to have extended deeper. There is some polymorphonuclear infiltration of the cutis vera below the vesicle with fragmented nuclei in the pus cells nearest the surface.

Giemsa.—No definite parasitic bodies were detected.

Levaditi's Method.—Liver, spleen, kidney, skin—no *spirochaetes* or other parasites detected."

TREATMENT OF PATIENTS.

The usual application made to the face in the early stages of the eruption was guaiacol in olive oil, 1 in 80 ; and to the body, eucalyptus in olive oil, 1 in 8. These gave relief in the great majority of cases. Calamine lotion was also sometimes applied to the face, but did not give the same sense of relief. When there was much swelling of the face the greatest benefit was derived from lint masks soaked in iced glycerine and water ($12\frac{1}{2}$ per cent.), and covered with oil silk, holes being cut for the eyes, nose, and mouth. Several, however, could not tolerate the pressure of the mask. Numerous other applications were tried, such as carbolic oil, 1 in 20 and weaker ; carbolized vaseline, 1 in 20 and weaker ; tincture of iodine ; 10 per cent. menthol in vaseline ; collodion flexile, &c. All these gave benefit in certain cases. Carbolic oil and menthol in vaseline gave the greatest relief to the pain experienced in profuse eruptions under the thick skin of the soles and palms.

Owing to the mildness of the disease, great difficulty was experienced in keeping patients with profuse eruptions in bed. It was noticed that staining was much more pronounced in those exposed to the sun than in those who were kept in the shaded wards.

Every patient was given a tonic mixture three times daily, consisting of quinine and perchloride of iron. Quinine was not administered to pregnant women, a mixture of iron and nux vomica being given.

Insomnia was a very frequent symptom. When hypnotics were necessary five grains of veronal were sufficient in most cases.

Boils were treated with permanganate of potash baths, and increasing doses of dilute sulphuric acid. They usually cleared up very quickly under this treatment, but in a few instances vaccine therapy was necessary.

To aid in clearing up the skin after the scabs had fallen off or where seeds in the palms and soles had been picked out, hot baths, vaseline, glycerine, &c., were applied. Pumice stone was adopted by the patients as a means for getting rid of the desquamation, but it is not to be commended on account of the tendency of any sore caused by rubbing to become septic. The quickest method of removing scales was by soaking the skin thoroughly in warm water with some soft soap in it, and then using a moist soaped flannel to rub with; washing soda in hot water was also useful in softening the skin, especially the soles.

Discharge of Patients.—No patient was discharged until the skin was smooth and free from scales. Attention was paid to the condition of the scalp, but apart from seborrhea, the scalp usually cleared up very quickly. No loss of hair was noted. The period of detention varied from three to nine weeks after the appearance of the eruption, depending on the severity of the eruption and the presence or otherwise of complications.

Each patient on discharge was given a 2 per cent. cyllin bath. Their clothes were disinfected with formaldehyde vapour. This was generated by the addition of potassium permanganate to formalin, 10 ozs. of the former to 1 pint of the latter for each 1,000 cubic feet.

Books were not allowed to be taken away from the Station unless they were sufficiently small to allow each leaf to be thoroughly disinfected with perchloride of mercury in methylated spirits, 1 in 1,000. Letters from the Station were also dealt with by this solution; the spirit did not cause the ink to run and evaporated quickly, leaving the perchloride behind.

THE INCUBATION PERIOD.

The earliest period in which the eruption appeared was on the eighth day after exposure. A child was born on 11th August, 1913, and the rash appeared on 18th August, 1913. The mother was perfectly healthy. She had been vaccinated not only in infancy, but also about five weeks before the birth of the child, the inoculations being successful in both cases. The father and daughter had been sent to Quarantine suffering from small-pox, the one nine days and the other 27 days before the birth of the child, the house being disinfected on both occasions. No onset of symptoms was noted in this case.

Another child exposed during the first two days of life to infection from the father developed the onset when eleven days old, and the eruption when thirteen days old. The mother was healthy.

In fourteen other cases the patient gave the history of only one exposure. The number of days between exposure and onset of symptoms was in 13 of these—6 days, 1 ; 10 days, 2 ; 11 days, 2 ; 12 days, 4 ; 13 days, 2 ; 14 days, 1 ; and 15 days, 1. The eruption appeared in the 14 cases—in 2 in 12 days ; 5 in 14 days ; 1 each in 15 and 16 days ; 4 in 17 days ; and 1 in 20 days.

In cases where the exposure lasted over several days, the longest interval recorded from the last exposure was sixteen days for the onset and nineteen days for the eruption.

An analysis of 24 cases which developed the onset after nine days had elapsed from the last exposure shows that the onsets occurred in 3 in 9 days ; 5 in 10 days ; 4 in 11 days ; 4 in 12 days ; 3 in 13 days ; 2 in 14 days ; 2 in 15 days ; and 1 in 16 days ; the eruptions appeared in 3 in 12 days ; 4 in 14 days ; 6 in 15 days ; 4 in 16 ; 3 each in 17 and 18 days ; and 1 in 19 days.

It is evident from the preceding that the latent period is extremely variable, ranging from six to sixteen days for the onset, and eight to twenty days for the eruption. It seems probable that the most usual period is between eleven and thirteen days for the onset, and fourteen and seventeen days for the eruption.

INFECTIVITY.

Direct personal infection seems to have been responsible for most cases attacked. In several cases, however, careful inquiry failed to discover any evidence of actual contact with an infected patient. Fomites have undoubtedly caused a few cases. One patient acquired the disease through sleeping on a mattress previously occupied by a patient. Infection conveyed by a third person has been the only method of infection elicited by inquiries from patients in a few cases. That infection remained in a house after the removal of a small-pox case appears to have been probable on a few occasions, cases occurring as long as a month after the last removal.

The patient is infectious throughout the whole course of the disease from the onset to the separation of the last crust. I have attempted to determine the period of greatest infectivity in 161 cases in whom the source of infection could be definitely traced. Any onset between the ninth and twelfth day from the development of the rash in the infecting patient was regarded as dating from the day of eruption, less than nine days as from the period of onset. In the other cases the onset was taken as twelve days. Taking these figures as a guide, it would appear as though these 161 cases were infected by patients in the following stages of the disease :—

Invasion period	14 cases.
First day of eruption	42 „
Second „ „	22 „
Third „ „	24 „
Fourth „ „	19 „
Fifth „ „	11 „
Sixth „ „	8 „
Seventh „	4 „
Eighth „ „	4 „
Ninth „ „ and over	13 „

It would thus appear as though the first days of the eruption were the most infectious. This corresponds with the period in which lesions are present in the mouth and throat, and hence the virus could easily be conveyed in minute droplets of saliva. The period of onset is certainly infectious, as some cases were traced in the early period of the epidemic to a patient who had an attack of *variola sine eruptione*.

In some cases it would appear as though the latent period was infectious. In families where one member only has been exposed to infection and developed the disease, other members have been observed to acquire it only a few days later, too short an interval having elapsed for the infection to have been conveyed by the first member after the onset of his symptoms.

The infectivity of the disease seems to be very low. Numerous examples occurred of one member of an unvaccinated family acquiring the disease, and in spite of exposure for a number of days, even in severe cases, none of the rest developed it. On the other hand the disease in some cases attacked every member, even in large families. Out of 213 contacts admitted to the Quarantine Station since November, 1913, only twelve developed the disease, although all had come into close contact with small-pox patients, several being exposed to severe cases for a number of days.

SUMMARY.

The disease is one affecting the unvaccinated and attacking principally young adults and adolescents. It is characterized by its extreme mildness, the superficial nature of its lesions, the lesions appearing in successive crops, the absence of severe secondary fever and consequent low mortality, and its absolute freedom from hæmorrhagic or toxic types. It has a definite relation to vaccination, recent successful vaccination being an absolute protection against the disease, and the disease preventing the performance of successful vaccination after the rash has appeared, except in a very few instances when the inoculation has been performed in the first day or two after the appearance of the eruption. It has a pronounced tendency to cause abortion or premature labour.

It resembles the Asiatic form of small-pox in its relation to vaccination, prodromal symptons, distribution of the lesions, and its influence on pregnancy.

APPENDIX "A."

PREGNANCY AND SMALL-POX

E T., aged 20 .. Nullipara. Previous miscarriages, nil. Mild discrete. Three months pregnant. Aborted twentieth day of efflorescence. Maternal surface of placenta showed several patches of degeneration.

A. H., aged 27 .. Nullipara. One previous miscarriage. Mild discrete. Six months pregnant. Miscarried a few weeks after the eruption. One twin, born covered with a variola rash, living for a few days. The other, still-born, without trace of eruption.

A F., aged 19 .. Nullipara. No previous miscarriages. Mild discrete. Four months pregnant. Aborted 30 days after eruption. Fœtus and membranes not apparently diseased.

E. C., aged 21 .. Nullipara. Mild attack. No previous miscarriages. Not affected.

C. S , aged 34 .. Semi-confluent. Four months pregnant. Aborted on twentieth day of eruption. Fœtus and membrane not apparently diseased. Patient was collapsed for a few days after.

A. L., aged 20 .. Nullipara. No previous miscarriages. Discrete case. Seven and a half months pregnant. Not affected. Gave birth to full-time healthy child.

S. B., aged 22 .. Pregnant. Mild discrete. Not affected.

M. N., aged 30 .. Multipara. Mild discrete. Eruption appeared six days after the birth of a healthy full-time child. Child did not develop the disease, but was three times unsuccessfully vaccinated.

M. M., aged 29 .. Multipara. Three children, all still-born. Treated after the birth of the first child for ulcerated throat. Gave birth to full-time healthy child on the fifth day of efflorescence. Semi-confluent. Child developed the eruption when five days old. Patient collapsed and died 2½ hours after delivery.

A. S., aged 35 .. Multipara. Five months pregnant. Mild discrete. No previous miscarriages. Patient not affected.

L. E., aged 25 .. Nullipara. No previous miscarriages. Semi-confluent. Seven months pregnant. Not affected. Gave birth to full-time healthy child.

M. J., aged 24 .. One previous child and one previous miscarriage. Semi-confluent. Seven months pregnant. Not affected. Gave birth later to full-time healthy child.

W. R., aged 25 .. Multipara. Mild discrete. No previous miscarriages. Not affected. Seven months pregnant. Gave birth later to a full-time healthy child.

S. C., aged 22 .. Multipara. (Two.) Mild discrete. No previous miscarriages. Eight months pregnant. Confined day after eruption. Child healthy, but developed eruption when fifteen days old.

A. W., aged 26 .. Multipara. (Two.) No previous miscarriages. Mild discrete. Eight months pregnant. Confined day after appearance of eruption. Child healthy, but developed the eruption when eleven days old.

E. F., aged 26 .. Multipara. (Three.) Mild discrete. No previous miscarriages. Eruption appeared two days after the birth of the child. Child healthy, but developed the eruption when nine days old.

E. G., aged 28 .. Multipara. (Two.) No previous miscarriages. Mild discrete. Five months pregnant. Not affected.

E. E., aged 30 .. Multipara. (Five.) No previous miscarriages. Mild discrete. Aborted 24 days after eruption. Fœtus and placenta apparently healthy. See report from the Microbiological Bureau, given in general report.

E. C., aged 28 .. Nullipara. No previous miscarriages. Mild discrete. Six months pregnant. Not affected.

M. L., aged 21 .. Multipara. (Two.) No previous miscarriages Mild discrete. Gave birth to healthy child one week after the appearance of the eruption. Child was vaccinated successfully when two days old, and did not acquire the disease.

R. W., aged 32 .. Multipara. (Four.) No previous miscarriages. Mild discrete. Three-four months pregnant. Aborted 29 days after eruption. Fœtus covered with profuse variola eruption.

E. W., aged 26 .. Multipara. (Two.) No previous miscarriages. Mild discrete Two months pregnant. Not affected.

A. C., aged 38 .. Multipara. No previous miscarriages. Severe case. Seven months pregnant. Not affected. Gave birth to full-time healthy child.

M. C., aged 24 .. Primapara. No previous miscarriages Severe case. Seven months pregnant. Gave birth to full-time healthy child.

M. O'B., aged 24 .. Multipara. (Two.) No previous miscarriages. Mild discrete. Three and a half months pregnant. Aborted nineteen days after eruption. No evidence of disease in placenta or fœtus.

F. G., aged 20 .. Multipara. (One.) No previous miscarriages. Mild discrete. Eight months pregnant. Not affected. Gave birth to full-time healthy child.

J. H., aged 27 .. Primipara One previous miscarriage. Mild discrete. Six months pregnant. Gave premature birth to twins nineteen days after eruption. Twins still-born. Both showed traces of eruption in the desiccation stage.

APPENDIX "B."

During the period 1st February to 31st August, 1914, both dates inclusive, 293 Small pox patients were admitted to the Quarantine Station, North Head. Thirty-seven contacts also developed the eruption on the Station in this period, and twelve, admitted as contacts, were found to have recently previously suffered from the disease, thus making a total of 342 confirmed cases of Small-pox.

AGE AND SEX INCIDENCE.

In the following table, which deals with the 342 confirmed cases, the term "vaccinated" means those successfully inoculated before exposure to infection :—

Years.	Males.		Females.	
	Unvaccinated.	Vaccinated.	Unvaccinated.	Vaccinated.
0–5	13	..	21	..
5–10	12	..	10	..
10–15	10	..	12	..
15–20	24	..	8	..
20–30	66	3	36	..
30–40	39	13	19	2
40–50	8	2	10	2
50 and over	7	15	7	3
Total	179	33	123	7

Vaccination.—Of the 342 cases, 233 were not vaccinated at all, 59 were successfully and 50 unsuccessfully vaccinated before the appearance of the small-pox eruptions.

The successful vaccinations were distributed as follows :—

(1) *Within the Incubation Period—a total of nineteen.* These were as follows :—

Six	days before eruption			..	2 cases
Eight	,,	,,	,,	..	2 ,,
Nine	,,	,,	,,	..	2 ,,
Ten	,,	,,	,,	..	2 ,,
Eleven	,,	,,	,,	..	5 ,,
Twelve	,,	,,	,,	..	2 ,,
Thirteen	,,	,,	,,	..	1 ,,
Fourteen	,,	,,	,,	..	2 ,,
Seventeen	,,	,,	,,	..	1 ,,

One of these had been previously recently unsuccessfuly vaccinated. The onsets of symptoms in the case in which the eruption appeared on the 17th day after vaccination was on the eleventh day. Of the two cases on the fourteenth day, one had the onset on the 9th day, but no onset was noticed in the other.

(2) *During infancy or more than thirteen years before attack—a total of* 40. One of these was vaccinated successfully a second time 20 years before, and two others had been recently unsuccessfully vaccinated.

(3) *Between these two periods*—Nil.

The unsuccessfully vaccinated were distributed as follows :—

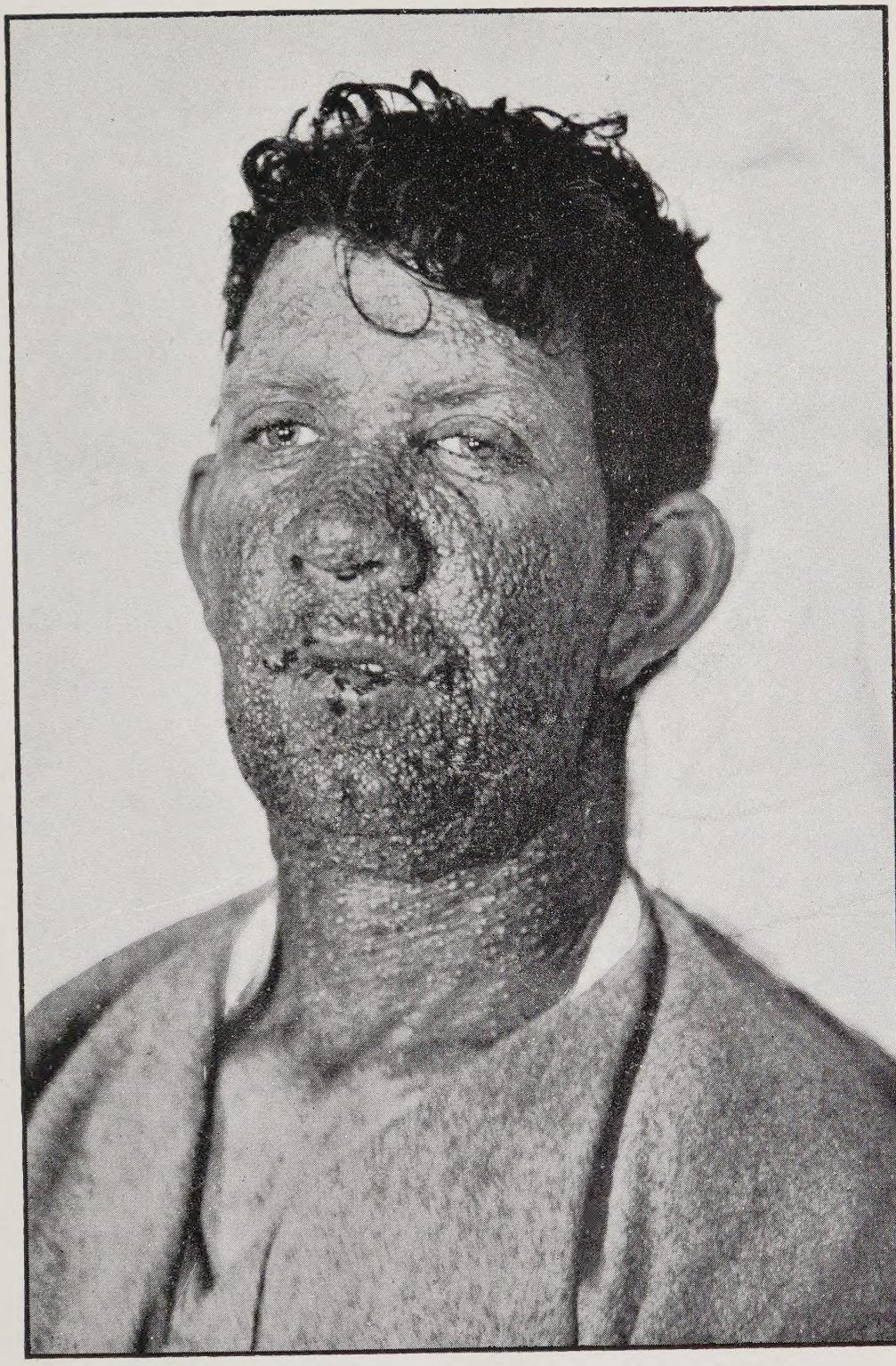
(*a*) *Within the incubation period—Fourteen.* Two of these were vaccinated unsuccessfully a second time within the incubation period.

(*b*) *During infancy—Eleven.* These are cases giving a history of infantile vaccination, but showing no cicatrices.

(*c*) *Between infancy and the incubation period—Twenty-five.* One of these was vaccinated unsuccessfully seven years before, but the others all within the previous eighteen months. Five of these were vaccinated a second or third time unsuccessfully.

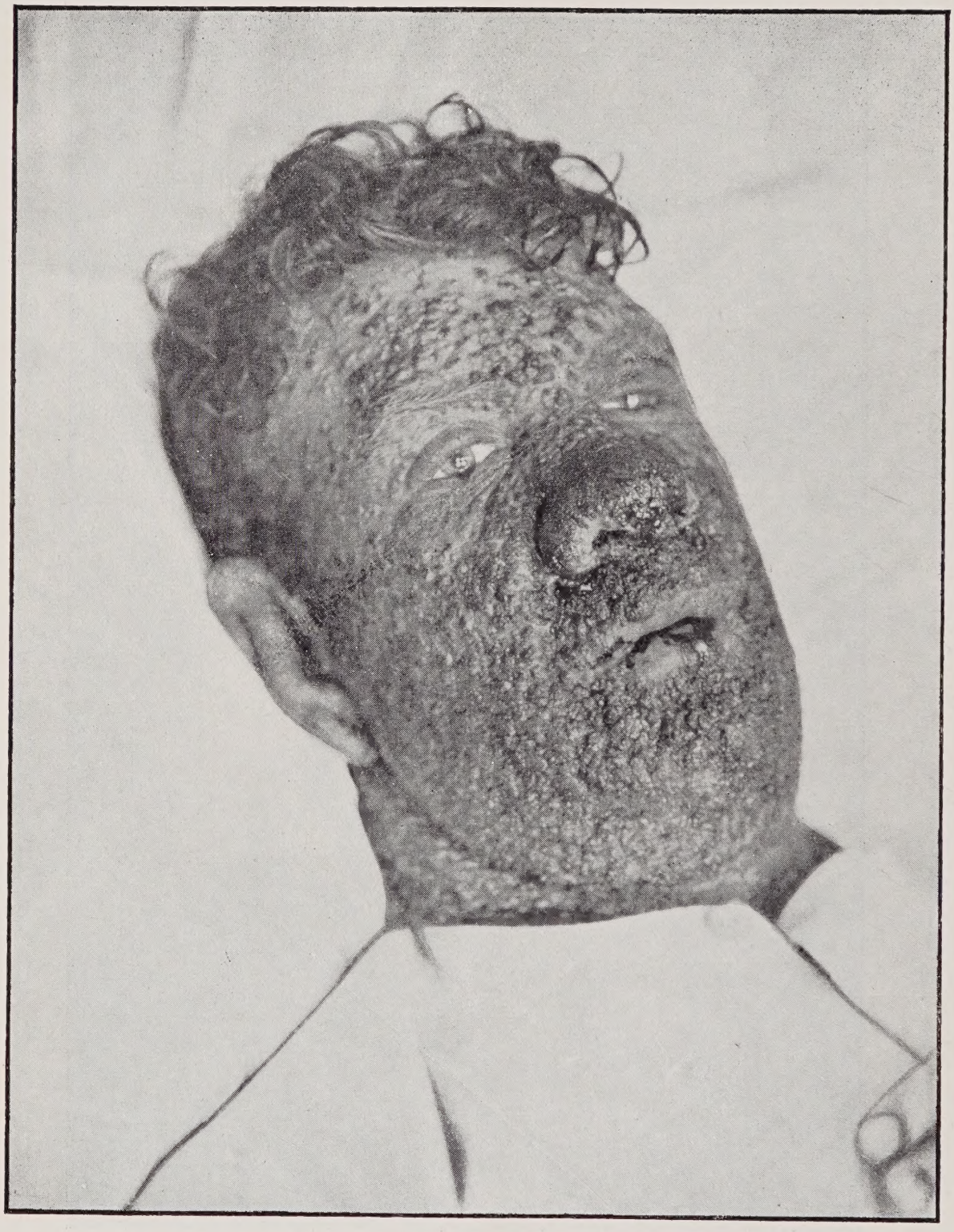
The absolute protection against Small-pox conferred by a recent successful vaccination has been very strikingly demonstrated. From the beginning of the epidemic up till the 31st August, 1914, 1,379 cases of Variola have been treated at the Station. Of these, none were successfully vaccinated within thirteen years of acquiring the disease. No less than 503 cases occurred in the unvaccinated during the first twenty years of life, but not one single instance amongst the successfully vaccinated.

By Authority : Albert J. Mullett, Government Printer, Melbourne.



No. 1.

C. H., male, aged 21. Unvaccinated. Fourth day of efflorescence. Severe case. Lesions in vesicular stage, but several show central scab. Note comparative immunity of orbits and abrupt transition of density in neck on part covered by collar. Nose presents swollen appearance.



No. 2.

Same patient. Seventh day of efflorescence. Crusts are now beginning to form through pustules rupturing. No marked œdema of the eyelids, but nose presents characteristic saddle shape. Crusts have become confluent in several places.

No. 3.

Same patient. Ninth day of efflorescence. All lesions now crusted and several scabs fallen off.

No. 4.

Same patient. Ninth day of efflorescence. Lesions wholly pustular. Several have hæmorrhagic areolæ.

No. 5.

Same patient. Ninth day of efflorescence. Eruption wholly pustular. Irregularity, superficial character, and thin-walled nature of lesions shown.

No. 6.

Same patient. Eleventh day of efflorescence. Only few crusts now remaining.

No. 7.

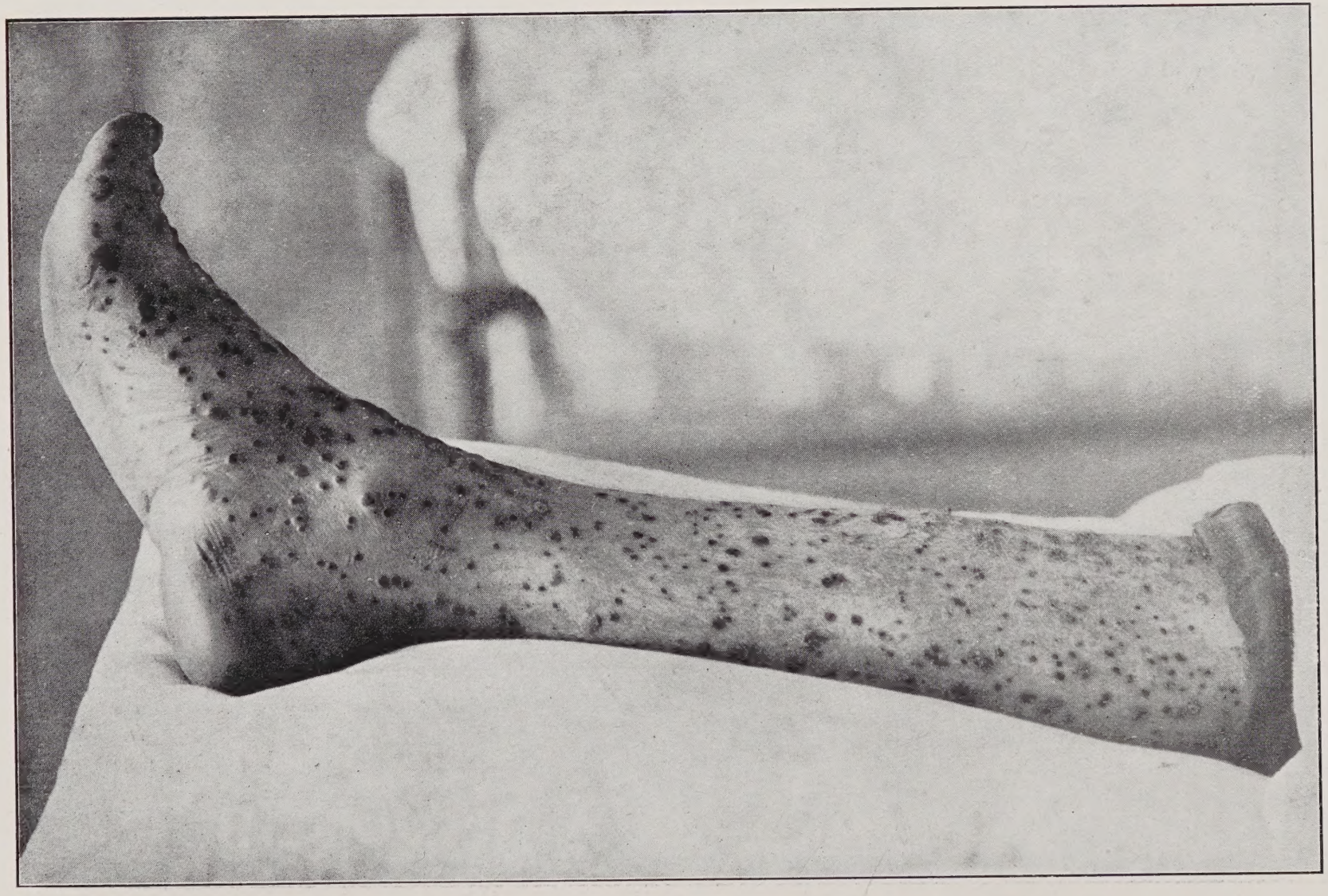
Same patient. Fourteenth day of efflorescence. Shows tuberculated elevations, left after separation of crusts, giving face remarkably rough appearance.

No. 8.

Same patient. Fourteenth day of efflorescence. Lesions have all scabbed.

No. 9.

Same patient. Fourteenth day of efflorescence. Though not distinctly shown, lesions in palms still pustular, though crusting advanced in several. Compared with No. 5, it will be seen that the incidence of rash on the flexor surfaces has been much less than on the extensor surfaces.

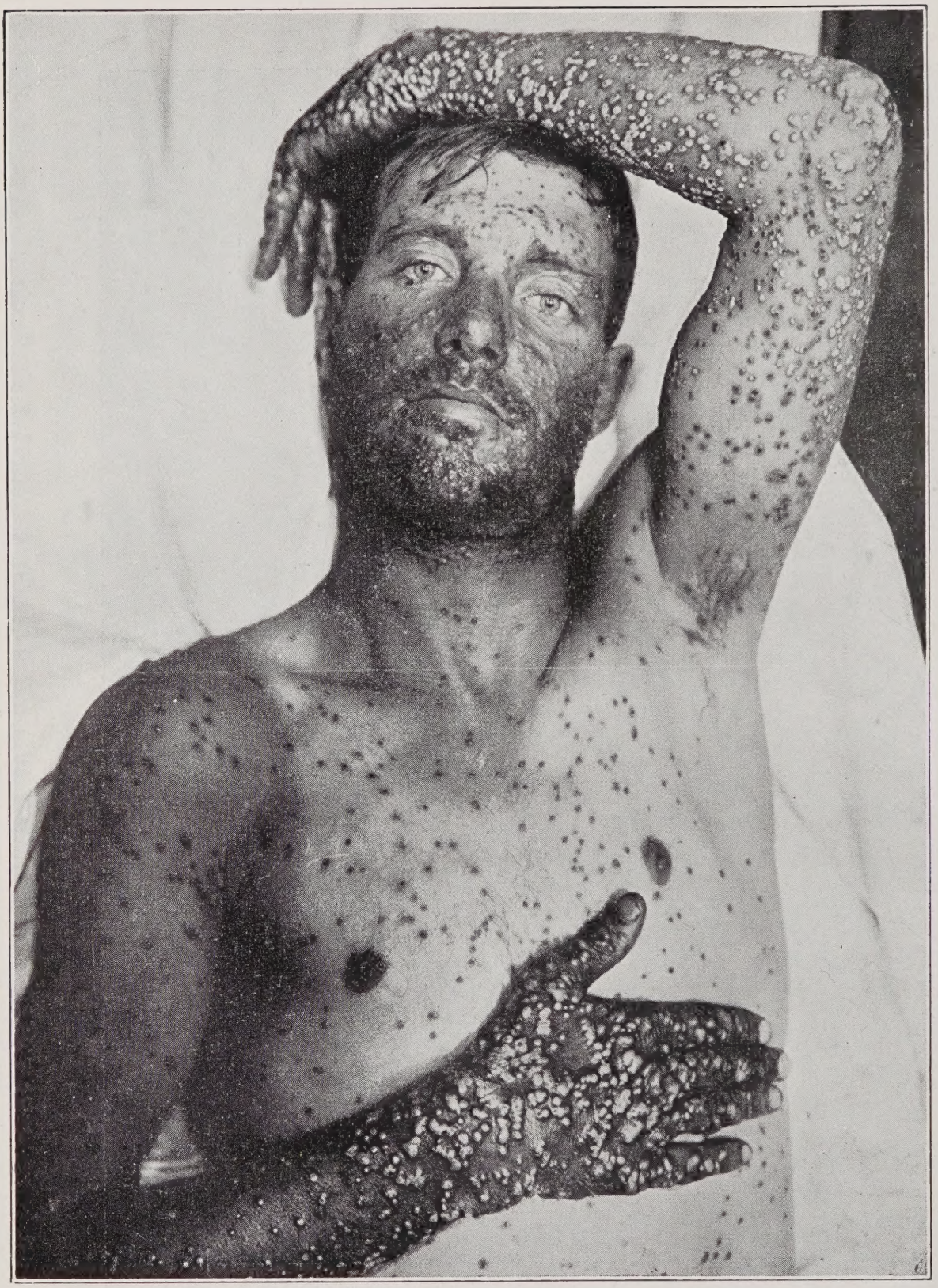


No. 10.

Same patient. Fourteenth day of efflorescence. Crusting completed on legs, but not so advanced on feet and soles. Immunity of plantar arch, and irritation patches over internal malleoli and front of ankle shown.

No. 11.

Same patient. Fourth day of efflorescence. The abrupt transition of density from below upwards is well shown. This patient was in the habit of working with coat off and short sleeves and area uncovered is well marked.

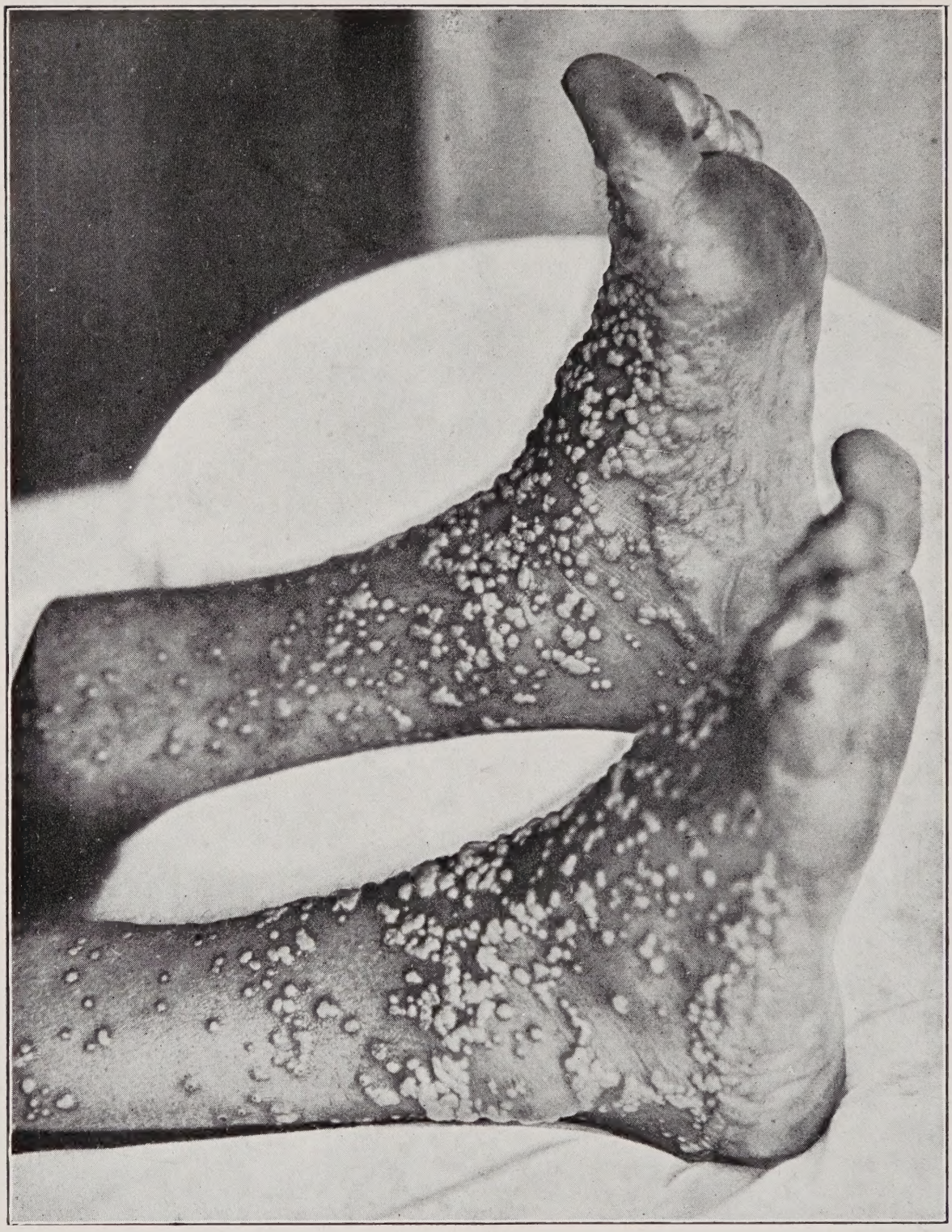


No. 12.

S. T. C., male, 28 years. Unvaccinated. Tenth day of efflorescence, showing comparative immunity of axilla and also abrupt transition of density of eruption in the part of neck covered by the collar and the part immediately above. Shows also the comparative immunity of posterior triangle and supra-sternal notch. Irritation patch on left elbow.

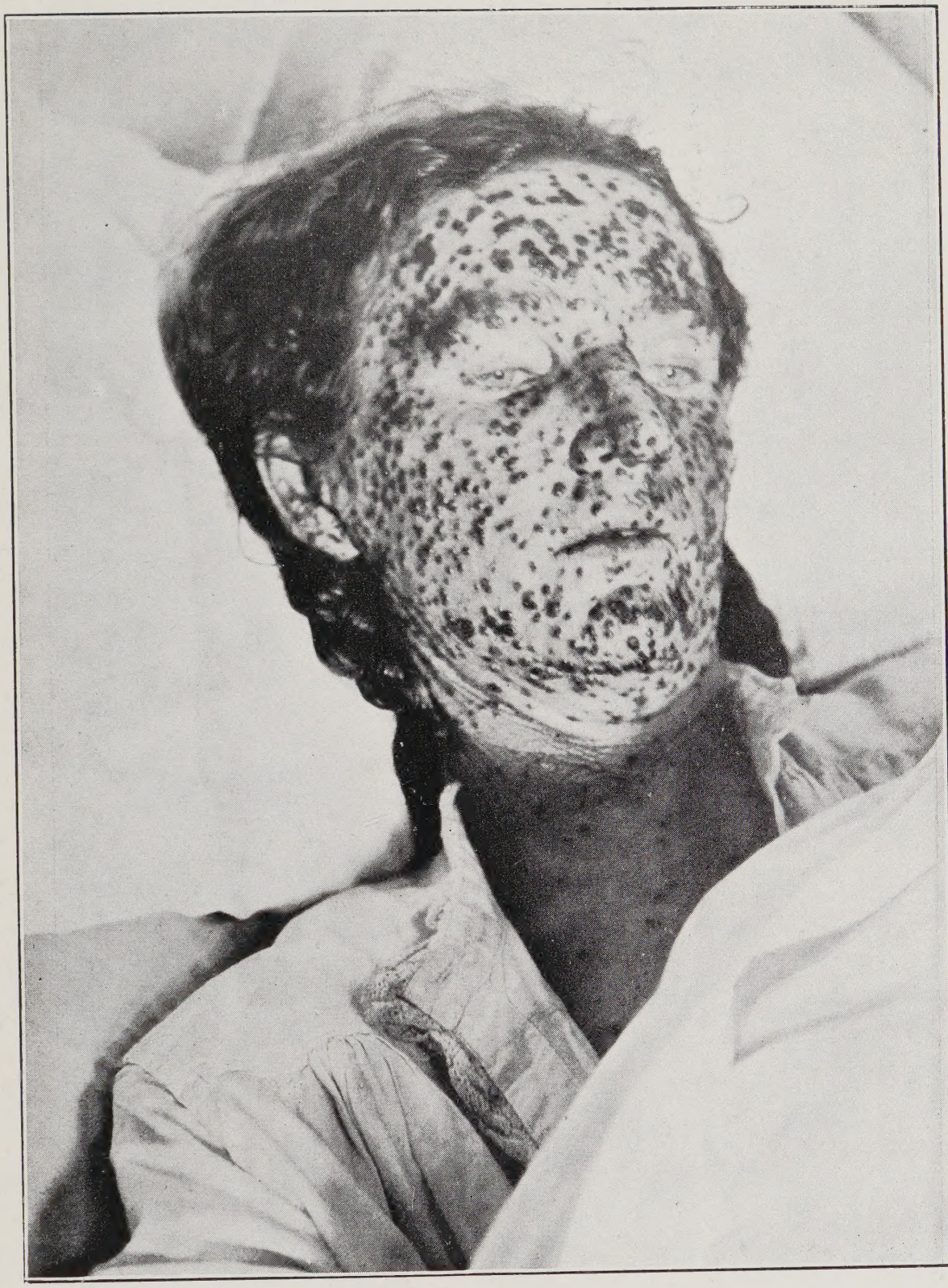
No. 13.

Same patient. Tenth day of efflorescence. Showing distribution over extensor aspects of forearms, wrists, hands, and fingers, and irregular character of lesions. Many are collapsed through absorption of fluid contents.



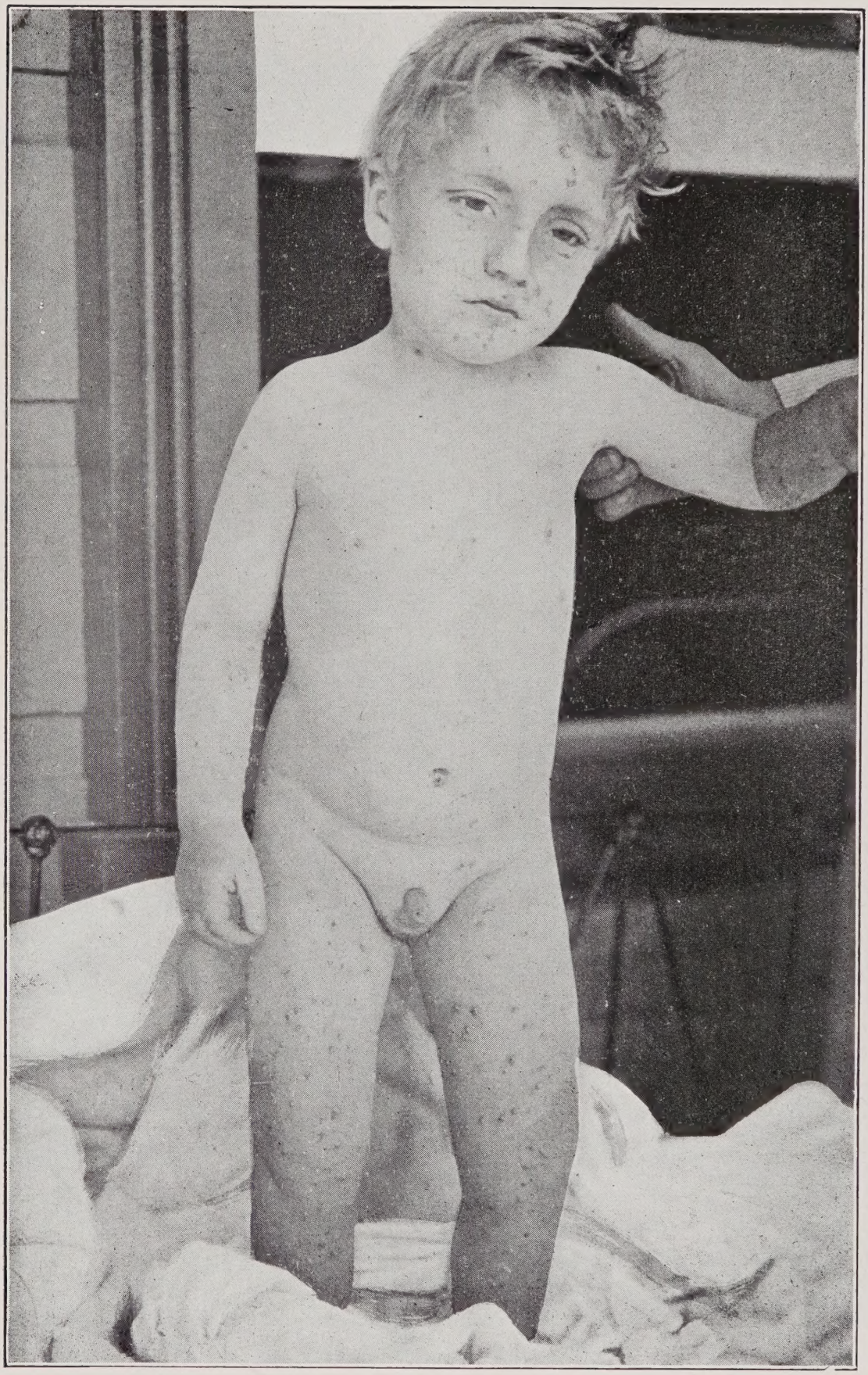
No. 14.

Same patient, 28 years. Tenth day of efflorescence. From excessive standing the eruption was very pronounced on the soles. The plantar arch has a more excessive crop than usual, explained by the patient's habit of placing feet on the office stool. Several clusters have been provoked round ankles and malleoli through friction of boots. Irregular character of lesions also illustrated.



No. 15.

A. C., 38 years. Unvaccinated. Ninth day of efflorescence. Lesions have all crusted. Note raised character of scabs, comparative immunity of orbits, and, to a lesser degree, temples.

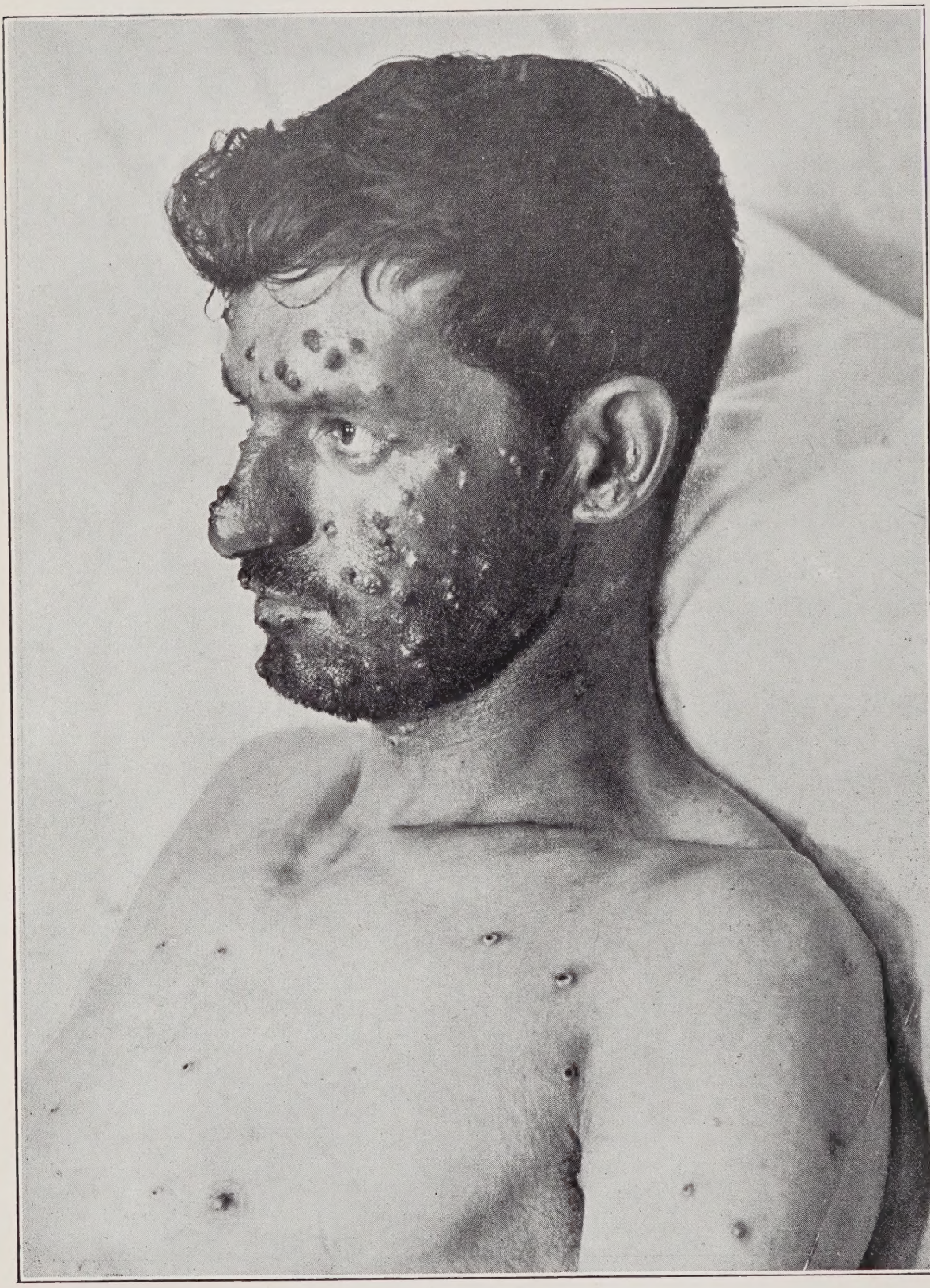


No. 16.

R. W., male, 2½ years. Unvaccinated. Very mild case. Showing unusual sparsity of eruption on the front of body.

No. 17.

H. McG., 14 years. Unvaccinated. Typical mild case.



No. 18.

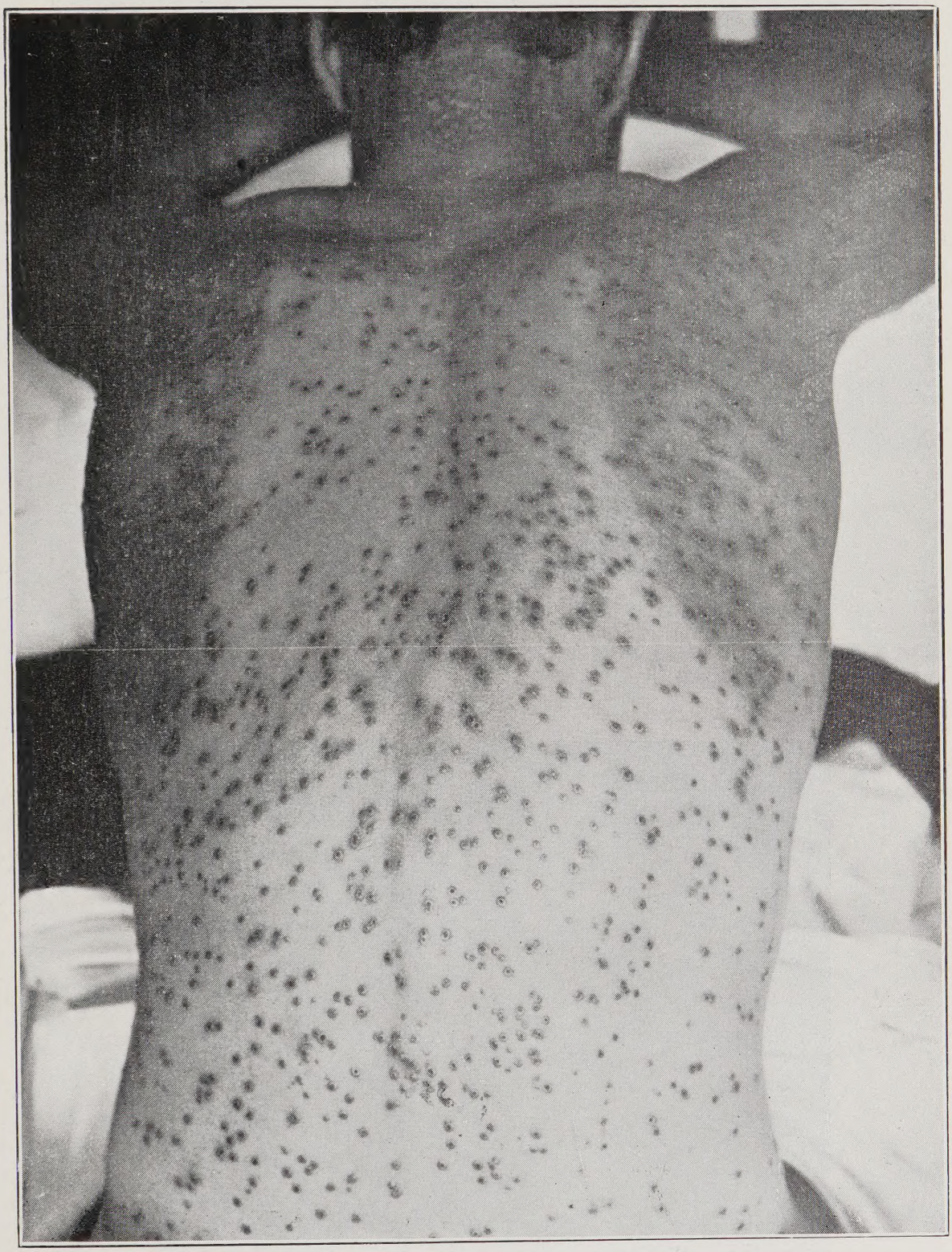
H. W., male, 30 years. Unvaccinated. Seventh day of efflorescence. Large wide-based discrete lesions. Note immunity of orbits, temples, and posterior triangles of neck.

No. 19.

C. S., female, 24 years. Unvaccinated. Sixth day of efflorescence. Shows typical appearance of face in stage in pustulation; swollen eyelids and saddle-shaped nose; some of the lesions crusting.

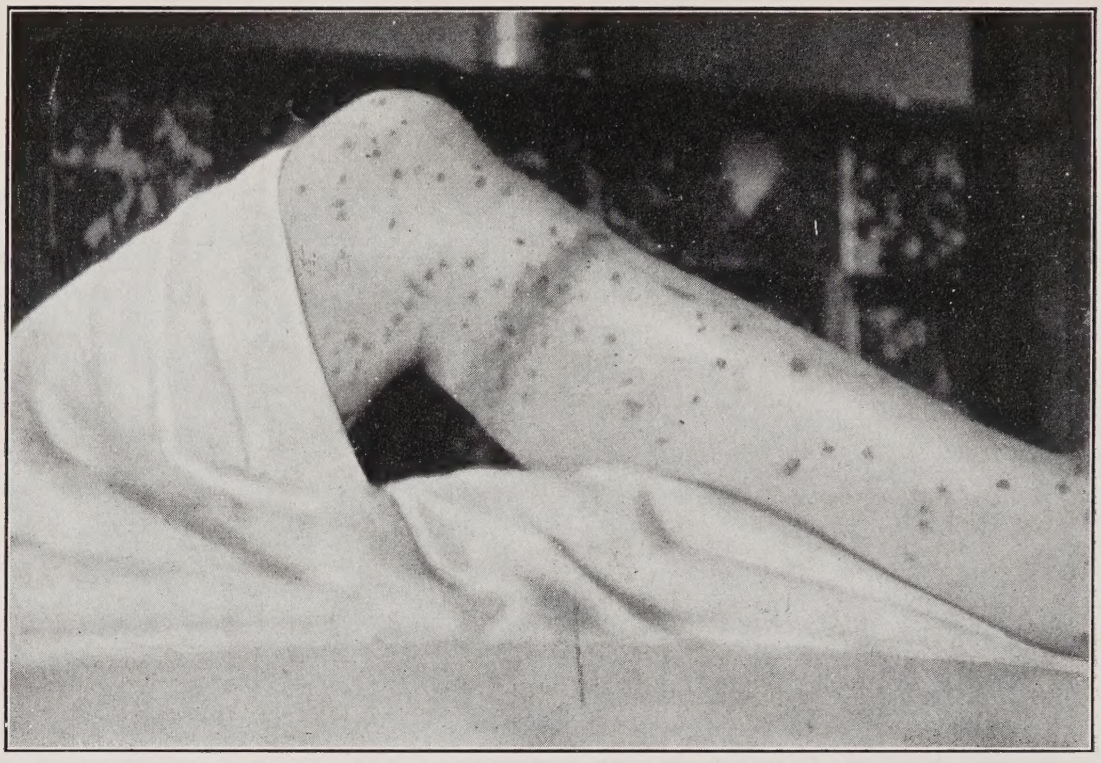
No. 20.

A. P., female, aged 54. Vaccinated in infancy. Fifth day of efflorescence. Crusting has already advanced on face, though several lesions still pustular.



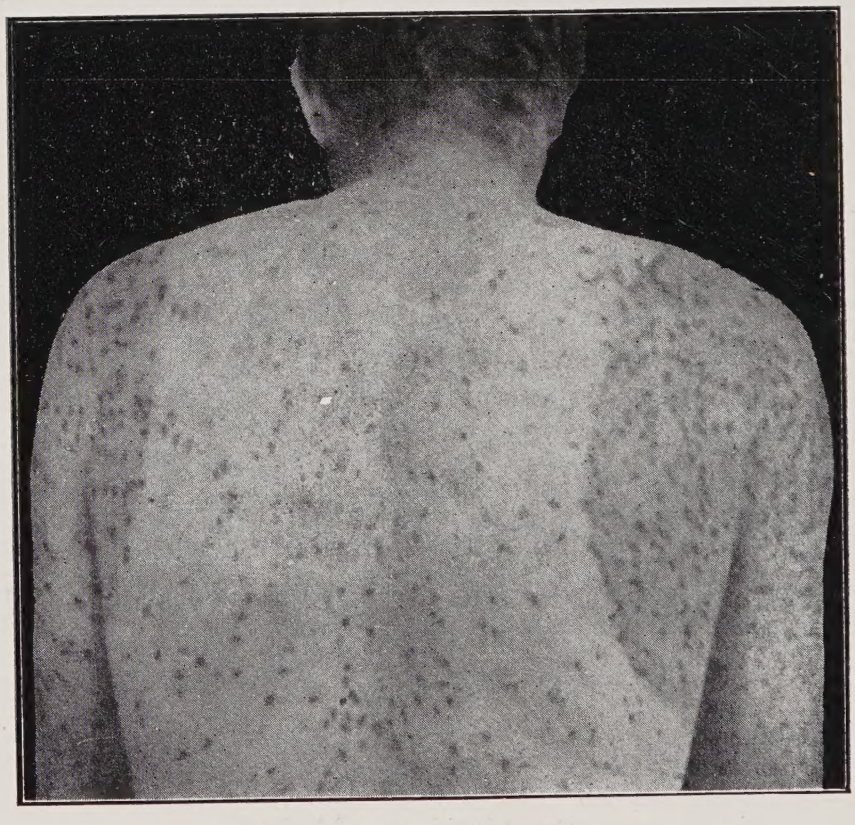
No. 21.

S. T. C., male, 28 years. Cluster over shoulders provoked by sunburn during incubation period. Outline of bathing suit distinctly seen. The rash was distributed more evenly than usual, practically no gradation from above downwards being seen. The prominences of the spine have a greater incidence of lesions.



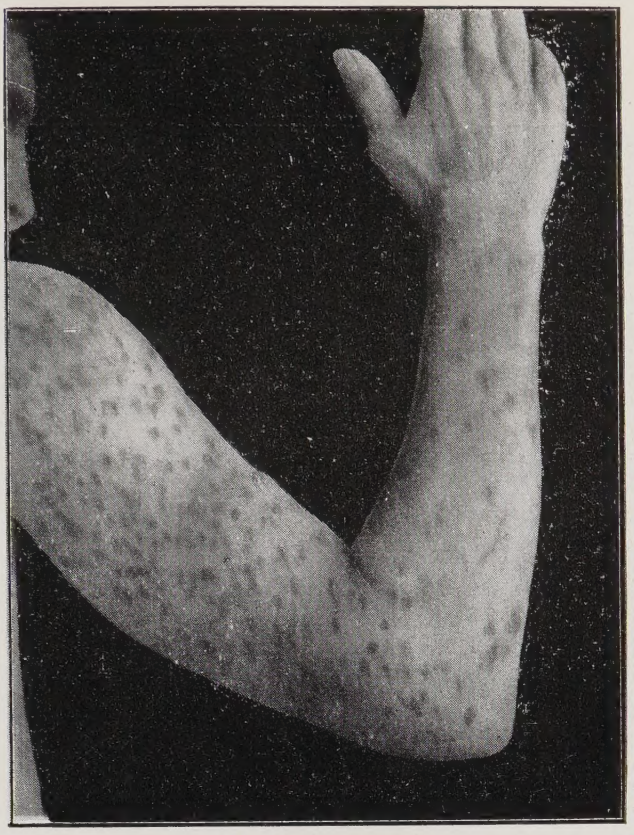
No. 22.

A. G. K., female, 45. Rash provoked by garter



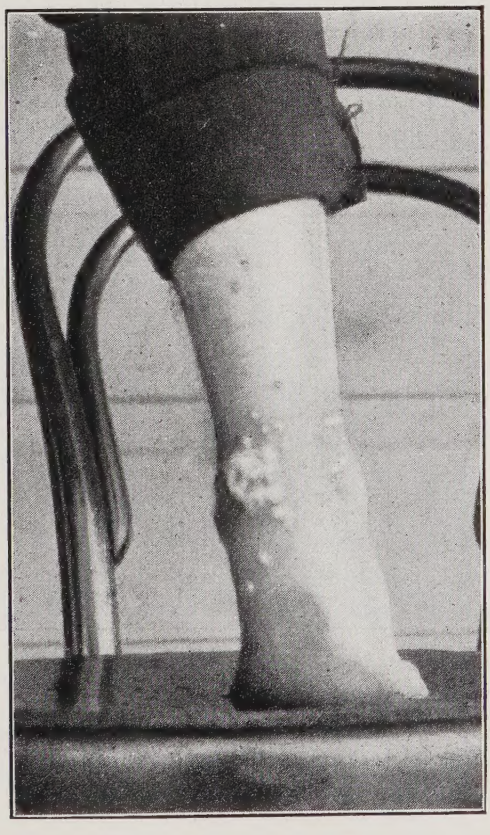
No. 23.

V. P. D., male, 33 years. Patient went swimming three days before onset of symptoms. Outline of bathing costume distinctly shown by greater incidence of eruption on the parts exposed to the sun.



No. 24.

Same patient as No. 34. Owing to the effect of recent sunburn the density of eruption diminishes from above downwards—a marked exception to the usual distribution

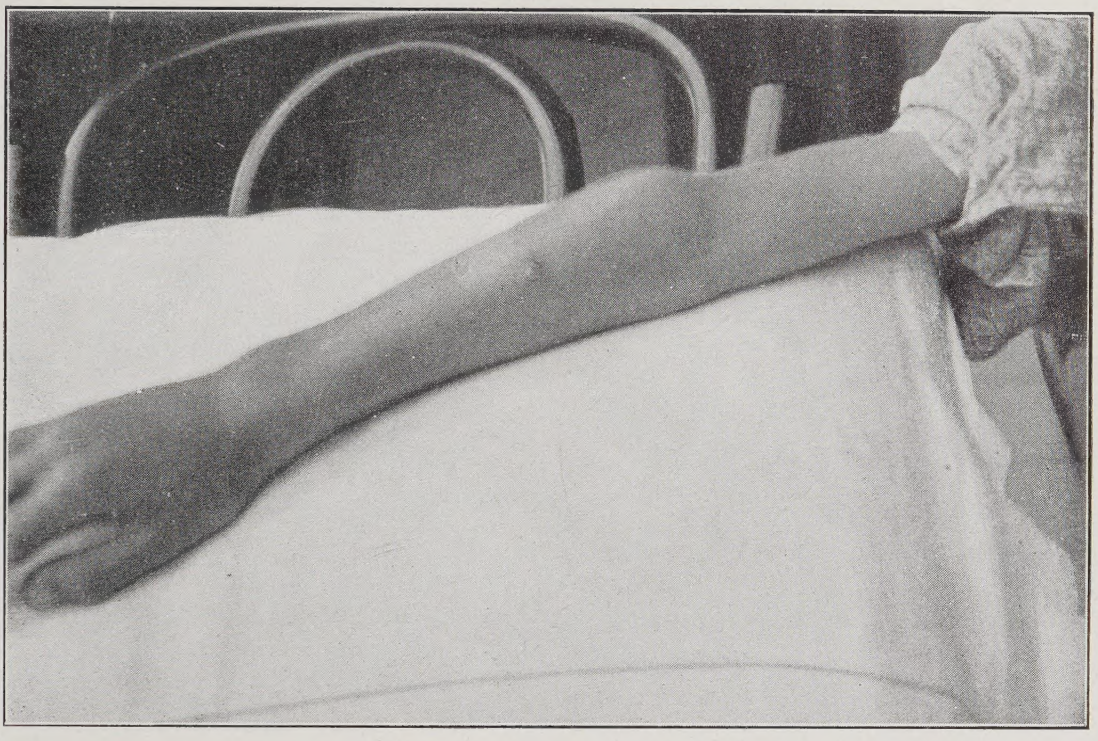


No. 25.

Same patient. Cluster of lesions over tendo achilles, due to friction of boots.

No. 26.

M. F. Mild case. Cluster of lesions round site of vaccinal inoculation. Shows immunity of orbits and posterior triangle.



No. 27.

R. K., male, 7 years. Lesion on forearm, vesicle of inoculated small-pox, probably on site of fleabite. This patient developed a sparse general variola eruption with constitutional symptoms, a few days after the first appearance of this lesion.

No. 28.

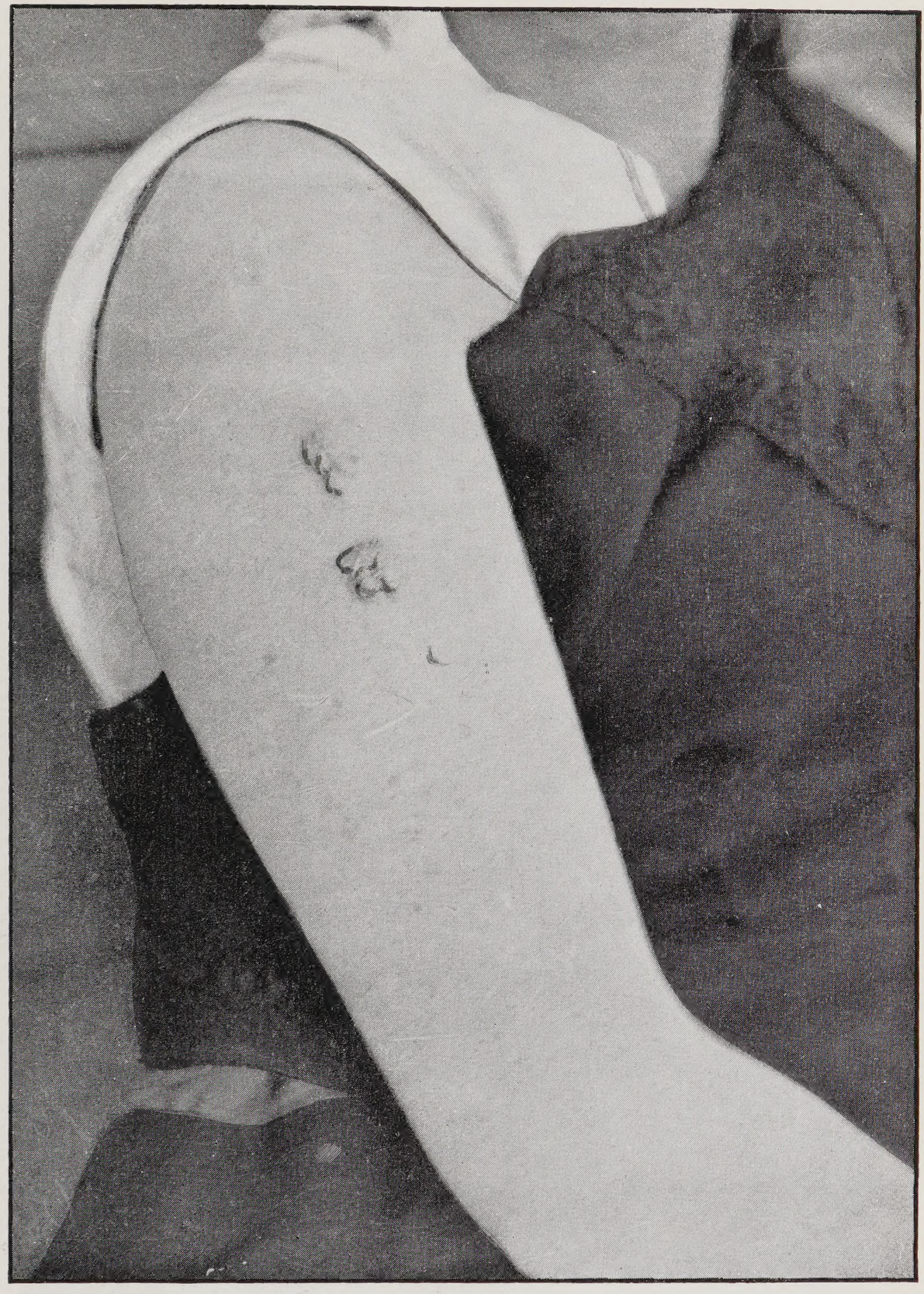
W. R., male, 54 years. Fifth day of efflorescence. Numerous lesions display hæmorrhagic areolæ.

No. 29.

H. L., 20 years. Fourteenth day of efflorescence. Illustrates tuberculated elevations remaining after crusts have fallen off.

No. 30.

A. W. D., 36 years. Characteristic pitting and staining.



No. 31.

V. V. Variola staining, and mulberry reaction of vaccination performed after eruption.

No. 32.

W. H., 21 years. Thirteenth day of efflorescence. Impetigo variolosa. A collection of fluid occurred round the dried crusts undermining the epidermis.

No. 33.

M. H. Impetigo variolosa.

No. 34.

E. M. H., 23 years. "Erythema Multiformes." This case was sent to Quarantine as a case of variola. On admission erythematous lesions were present on face, forearms, back of hands, and wrists, also numerous on thighs and legs, but in these situations resembled erythema nodosum. The trunk was not attacked.

No. 35.

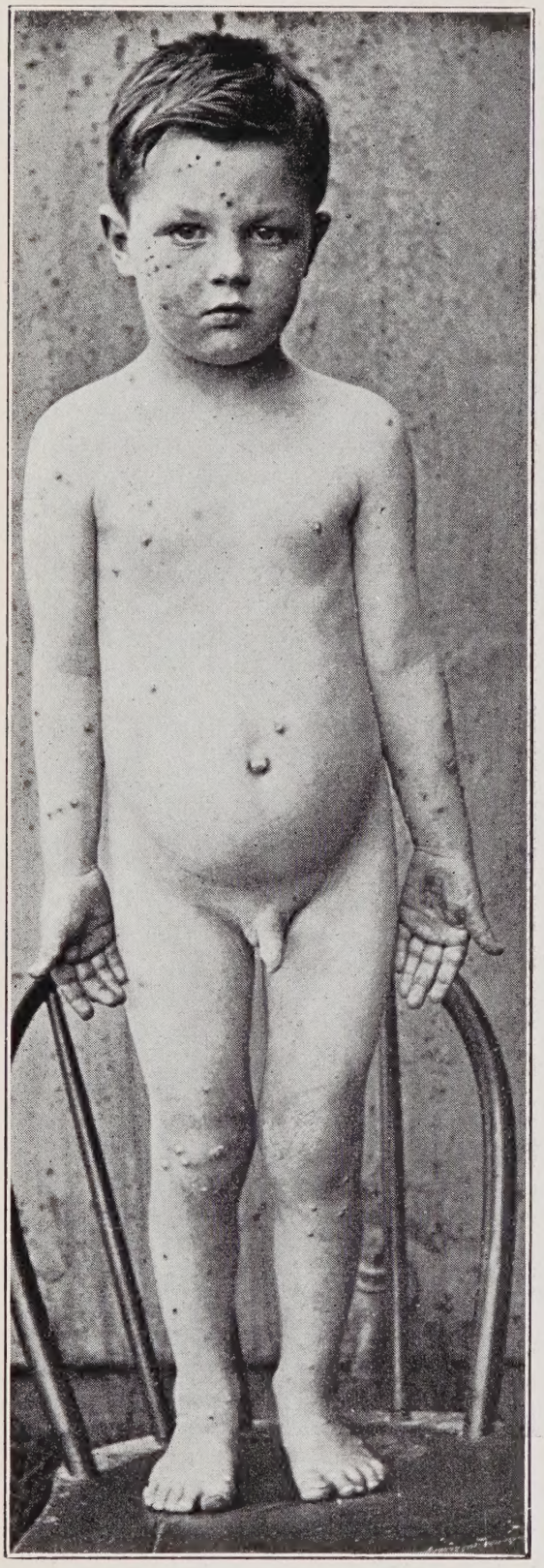
Twins. Mosquito bites, mistaken for variola. Confusion was caused by the distribution. The exposed portions—face and extremities—were most affected, but the body, exposed by uncovering during sleep, was also bitten.

No. 36.

I. W., aged 14. Successful vaccination, tenth day. Vaccinal eruption, confined to face.

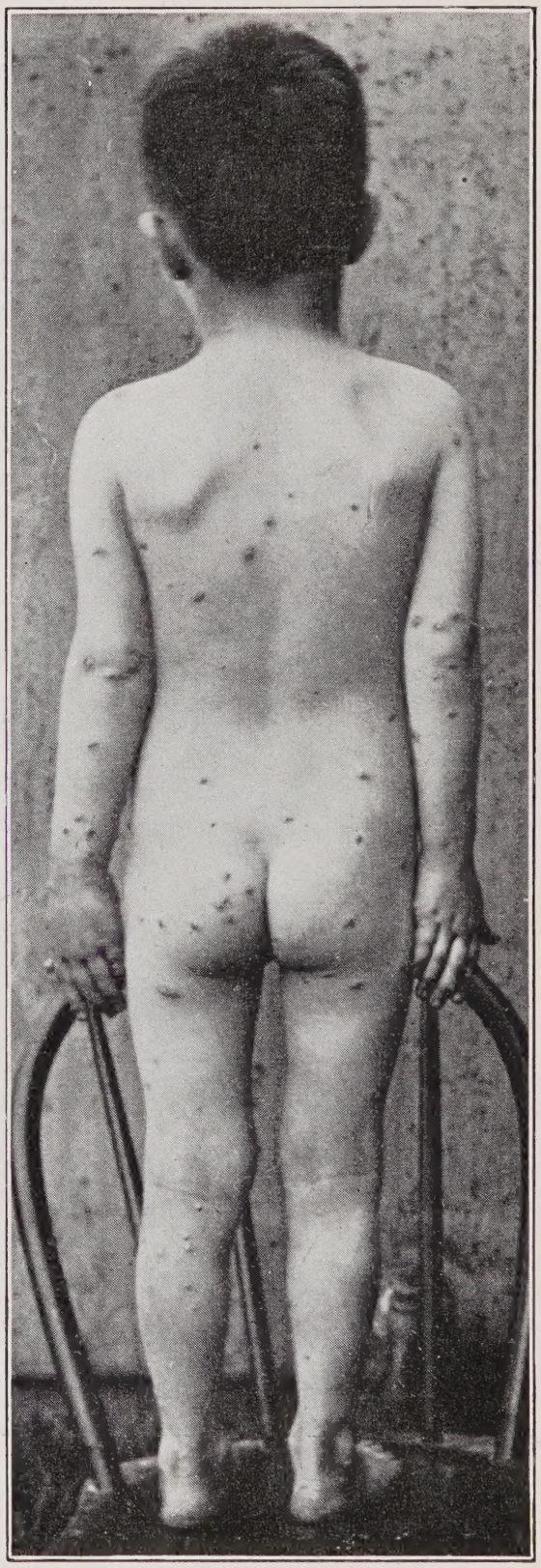
No. 37.

Tuberculated elevations left after the shedding of the crusts. The comparative freedom at the edge of the scalp is due to the protection afforded by the hair against sunburn.



No. 38.

The rash is very meagre, but a selection has been shown for the face and limbs.



No. 39.

Same patient as No. 38. The rash on the extensor aspects of the elbow and forearm has been greater than on the flexor.

No. 40.

The palms of a patient showing the formation of brown crusts ("seeds") under the cuticle.

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